

Fishery Data Series No. 11-33

Upper Cook Inlet Salmon Escapement Studies, 2009

by

David L. Westerman

and

T. Mark Willette

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Alaska Department of Fish and Game

Divisions of Commercial and Sport Fisheries



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Weights and measures (metric)		General	Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis
gram	g			base of natural logarithm
hectare	ha			catch per unit effort
kilogram	kg			coefficient of variation
kilometer	km	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	common test statistics
liter	L			(F, t, χ^2 , etc.)
meter	m		@	confidence interval
milliliter	mL	at		correlation coefficient
millimeter	mm	compass directions:		(multiple)
		east	E	correlation coefficient
		north	N	(simple)
		south	S	covariance
		west	W	degree (angular)
		copyright	©	degrees of freedom
		corporate suffixes:		expected value
		Company	Co.	greater than
		Corporation	Corp.	greater than or equal to
		Incorporated	Inc.	harvest per unit effort
		Limited	Ltd.	less than
		District of Columbia	D.C.	less than or equal to
		et alii (and others)	et al.	logarithm (natural)
		et cetera (and so forth)	etc.	logarithm (base 10)
		exempli gratia		log
		(for example)	e.g.	logarithm (specify base)
		Federal Information Code	FIC	minute (angular)
day	d	id est (that is)	i.e.	not significant
degrees Celsius	°C	latitude or longitude	lat. or long.	null hypothesis
degrees Fahrenheit	°F	monetary symbols		percent
degrees kelvin	K	(U.S.)	\$, ¢	probability
hour	h	months (tables and figures): first three letters		probability of a type I error
minute	min	letters	Jan,...,Dec	(rejection of the null hypothesis when true)
second	s	registered trademark	®	probability of a type II error
		trademark	™	(acceptance of the null hypothesis when false)
		United States		second (angular)
		(adjective)	U.S.	standard deviation
		United States of	USA	standard error
		America (noun)	United States Code	variance
		U.S.C.	use two-letter abbreviations (e.g., AK, WA)	population sample
		U.S. state		Var
				var
Physics and chemistry				
all atomic symbols				
alternating current	AC			
ampere	A			
calorie	cal			
direct current	DC			
hertz	Hz			
horsepower	hp			
hydrogen ion activity (negative log of)	pH			
parts per million	ppm			
parts per thousand	ppt, ‰			
volts	V			
watts	W			

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David L. Westerman

Alaska Department of Fish and Game, Division of Commercial Fisheries, Soldotna
and

T. Mark Willette

Alaska Department of Fish and Game, Division of Commercial Fisheries, Soldotna

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

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*David L. Westerman,
Alaska Department of Fish and Game, Division of Commercial Fisheries,
Soldotna, Alaska USA*

*T. Mark Willette,
Alaska Department of Fish and Game, Division of Commercial Fisheries
Address, USA*

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ABSTRACT

For inseason management in 2009, DIDSON (Dual-frequency Identification Sonar) was used to estimate total sockeye salmon (*Oncorhynchus nerka*) escapement into the Kenai River and for the first time into the Yentna River, Upper Cook Inlet Alaska. Bendix side-looking sonar was used for the last time in the Kasilof River and will be used for inseason management in 2010. A sockeye salmon escapement range rather than a point estimate was reported for the Yentna River due to uncertainty regarding fish wheel selectivity. The DIDSON estimates of total salmon passage at the Yentna River were apportioned to species using a set of 6 fish wheel selectivity coefficients obtained from previous studies on the Susitna and Taku rivers. The reported sockeye salmon escapement range was the minimum and maximum of these 6 estimates and an estimate assuming no fish wheel selectivity. The same method was applied to develop pink, chum and coho salmon escapement range estimates. The Crescent River project did not operate in 2009, due to safety concerns arising from Redoubt volcano activity. In 2009, sockeye salmon escapement estimates were 745,170 into the Kenai River and 297,125 into the Kasilof River. A minimum and maximum escapement range of 43,972–153,910 sockeye salmon was estimated for the Yentna River. Passage estimates were often incomplete for pink salmon (*O. gorbuscha*), coho salmon (*O. kisutch*), chum salmon (*O. keta*) and Chinook salmon (*O. tshawytscha*) in some of the rivers and may not be an index of total run strength. The predominant age classes for sockeye salmon in the Kenai River were 1.3 (72.6%), 2.2 (9.8%) and 2.3 (9.7%); for the Kasilof River, 1.3 (60.4%) 2.2 (17.2%); and 2.3 (13.6%) and for the Yentna River, 1.2 (33.9%), 1.3 (31.6%) and 2.2 (17.2%).

Key Words: Upper Cook Inlet, sockeye salmon, Kenai River, Kasilof River, Crescent River, Yentna River, Susitna River, age/sex/length, sonar, escapement, passage, fish wheel, substrate-less, Bendix, DIDSON.

INTRODUCTION

The 3 main objectives of Upper Cook Inlet (UCI) salmon (*Oncorhynchus* sp.) escapement projects in 2009 were to estimate the sockeye salmon (*O. nerka*): (1) daily and cumulative escapement into the Kenai and Kasilof rivers; (2) escapement range for the Yentna River; and (3) age, length, and sex compositions. Meeting these objectives helps fishery biologists manage for commercial fisheries escapement goals in UCI.

Optimal escapement goals (OEG) were established by the Alaska Board of Fisheries for late-run sockeye salmon passage into the Kenai and Kasilof rivers. These OEGs consider both biological and allocative issues. The OEG for sockeye salmon into the Kenai River is 500,000–1,000,000 and for the Kasilof River is 150,000–300,000 fish. The Alaska Department of Fish and Game (ADF&G) also managed for inriver escapement goals for the Kenai River, which are dependent upon forecasts and daily inseason evaluations of run strength. If the forecast is for a run of <2.0 million fish, the inriver escapement goal is 650,000–850,000 sockeye salmon; for a run of 2.0–4.0 million, the inriver goal is 750,000–950,000 fish; and for a run >4.0 million fish, the inriver goal is 850,000–1,100,000 fish. A sustainable escapement goal (SEG), an escapement index that provides for sustained yields over a 5–10 year period, was also set for the Kenai River at 500,000–800,000 sockeye salmon (Fair et al. 2007). In 2009, a previous SEG for Yentna River sockeye salmon was eliminated due to uncertainty in the Yentna sonar|fish wheel escapement estimates. Instead, 3 weir-based SEGs were established for Susitna River sockeye salmon at Judd (25,000–55,000), Chelatna (20,000–65,000), and Larson (15,000–50,000) lakes (Fair et al. 2009). Although escapement data was not collected from the Crescent River in 2009, the biological escapement goal (BEG), which provides for the greatest potential for maximum sustained yield, is 30,000–70,000 sockeye salmon.

Prior to 1968, sockeye salmon escapement estimates in UCI (Figure 1) were based on surveys of clear water spawning areas and provided no information about the distribution or number of sockeye salmon in glacially occluded waters (King et al. 1989). Commercial and recreational fishery management efforts were further hampered by lack of daily and cumulative estimates of

escapement. These constraints were significantly reduced by the development of side-looking (once referred to as side-scan) sonar techniques by Bendix Corporation¹ to enumerate sockeye salmon in certain glacial tributaries of UCI.

The use of sonar to estimate salmon passage began on the Kenai and Kasilof rivers in 1968 with the use of multiple transducer systems (MTS), transducers arrayed linearly in up-looking positions (Namtvedt et al. 1977; Davis 1971). Transition from MTS to side-looking sonar aimed horizontally atop an artificial substrate was tested in the Kenai River in 1977 when a single side-looking system (1977 model) transducer was deployed on the north bank between 12 July and 3 August (passage counts in 1977 derived by an MTS array). Side-looking sonar proved to be more practical and was implemented on the Kenai River in 1978. A similar unit was deployed for the first time on the north bank of the Kasilof River in 1977 (south bank counts were also derived by use of an MTS array), and by 1979 both banks of the Kasilof River were utilizing side-looking sonar. Side-looking sonar has been used to enumerate the Crescent River escapement since 1979. In the Susitna River, an attempt to utilize MTS equipment failed in 1976, leading to the use of side-looking sonar, which began with limited success in 1978.

All side-looking transducer systems were mounted on 15 cm (6 in) by 18.3 m (60 ft) diameter aluminum tubing, (artificial substrate), and positioned on the bottom of the river, perpendicular to the bank. This arrangement forced fish to move across the artificial substrate and through the sonar beam. A transition to substrate-less counters was initiated in the late 1980s because of the effect the artificial substrate had on fish behavior and the constant maintenance and safety problems caused by tree and brush entanglements with the tube. Substrate-less counters were deployed for the first time in the Kenai River in 1987 (north bank) and 1993 (south bank); Crescent River (both banks) in 1988; Yentna River in 1994 (south bank) and 1995 (north bank); and Kasilof River in 2003 (both banks).

In the late 1970s and mid-1980s, the Kasilof, Crescent, and Yentna River sonar sites were relocated to their present sites. The Kenai River sonar site has been located at river kilometer 30.9 (mile 19.2) since the 1960s. In 1983, the Kasilof River site was relocated from the outlet area of Tustumena Lake (about 3 km below the lake) to river kilometer 12.1 (mile 7.5), above the Sterling Highway bridge, closer to Cook Inlet (King and Tarbox 1984). Escapement enumeration began at Crescent River in 1980 below the outlet of Crescent Lake but was relocated nearer Cook Inlet (~2.5 km or 1.5 mi) in 1984 (King and Tarbox 1987). The Susitna River counting site was abandoned in 1985 when recurrent flooding rendered the site untenable. The site was relocated to the Yentna River in 1986, about 9.2 km (6 miles) upstream of the confluence with the Susitna River and about 53 km (33 miles) from Cook Inlet.

A dual-frequency identification sonar (DIDSON; Belcher et al. 2001, 2002) was used for the first time to estimate salmon passage in UCI on the south bank of the Kenai River in 2007 and on the north bank in 2008; and for the first time in the Yentna River (both banks) in 2009. The DIDSONs were tested on both banks of the Kasilof River between 2006 and 2009 and are expected to be deployed in the Kasilof River in 2010 to replace Bendix counters (Holmes et al. 2006; Maxwell and Gove 2007).

Fish wheels have been used at the sonar sites to apportion sonar counts by species when necessary and to collect age, sex and length (ASL) composition data from sockeye salmon. Fish

¹ Product names used in this report are included for scientific completeness, but do not constitute a product endorsement.

wheels were deployed along the north bank of the Kenai River, north bank of Kasilof River, and on both banks of the Yentna River. Prior to 1999, we required a minimum fish wheel sample of 150 fish to constitute a period for apportioning sonar counts in the Kenai River. However, during periods of low passage rates, several days were often required to attain an adequate sample size. We replaced the sample size requirement ($n=150$ fish) with a percentage (varies between rivers) of actual daily fish wheel catches in 2000 and thereafter. Altering the method by which sonar counts were apportioned did not significantly change the final estimates ($p<0.05$; S. Carlson, Biometrician, ADF&G, Soldotna, personal communication) and was more defensible. In 1999, we began using the current criteria for species apportionment, i.e., when an upward trend in the catch was imminent and species other than sockeye salmon exceeded 5% of the total fish wheel catch for the Kenai River. We have since applied the same criteria to the Kasilof River. Prior to 1993, drift gill nets and a fish trap were used in the Crescent River to capture fish for species apportionment and ASL sampling. The installation and use of a fish wheel in 1993 provided a larger sample size and probably reduced or eliminated size and species selectivity biases inherent to the former gear type (gill nets). Two fish wheels, one deployed on each bank, have always been required on the Yentna River because of a substantial difference in the species composition along each bank. Factors influencing the accuracy of fish passage estimates for pink, coho, chum, and Chinook salmon in the Yentna River have been discussed by Tarbox et al. (1981, 1983).

In 2009, the ADF&G began a fish wheel selectivity study on the Yentna River (funded by the Alaska Sustainable Salmon Fund (AKSSF). A fish wheel deployed near Flathorn on the west bank of the Susitna River several miles below its confluence with the Yentna River was used to capture, mark (dart tags) and release tagged fish. Fish wheels at the Yentna River sonar site recovered tagged fish to estimate the selectivity of each species, assuming that all species were equally likely to be captured. Project results will be published in a separate report but not until the project has concluded in 2012.

METHODS

In 2009, DIDSON was used to enumerate escapements into the Kenai River and Yentna River. Bendix sonar counters were used for the last time to enumerate the Kasilof River.

BENDIX SONAR OPERATIONS

In 2009, total salmon escapement into the Kasilof River was estimated using Bendix Corporation side-looking sonar counters (1978 and 1980 models) as described by King and Tarbox (1989), Gaudet (1983), and Bendix Corp. (1980 and 1984). The Bendix counters have a fixed pulse width of 100 μ s and use a 515 kHz transducer with 2- and 4-degree transducer elements multiplexed in an alternating mode or on a single beam.

Prior to startup, we checked Bendix counters for operational capabilities. Specifically, we inspected pulse rates, maximum voltage outputs (with a transducer attached), voltage returns from a fish simulator, pulse widths (100 μ s), hits to count criteria, and printer function and accuracy of every counter. During the testing, we also compared cumulative counts to sector counts for accuracy. Russ Thynes of Petersburg Electronics made the repairs when needed.

On the Kasilof River, we aimed the Bendix transducers by remotely controlled HTI rotators on both banks (tilt only). We tested the aim by moving an artificial target (a sealed, weighted plastic sphere with a target strength approximating that of an adult salmon) along the river

bottom and through the ensonified area at various, (reachable) distances from the transducer. We verified the counter's detection of the target with simultaneous visual recognition of the target on an oscilloscope. Our transducer placement from (and along) the shore has been relatively consistent from year to year and has always been based on substrate, water depth and velocity where ~80% of the fish will pass within the nearshore half of our ensonified area (counting range). We placed short weirs (<6 m long) immediately downstream of the transducer to prevent fish from passing behind or too close to the transducer, ensuring that fish pass through the sonar beam.

The Bendix transducers convert electronic signals into sound (acoustic signal) and transmit this sound, through the water along the river bottom. Any object or target, that passes through this acoustic signal will return an echo to the counter for electronic interpretation. Before a target can be counted as a single 'fish' by the Bendix counter, the echoes must meet or exceed a set threshold and fixed 'hits to count' criteria and ping rate (pulse repetition rate) must match the swim speed of fish. We counted targets by observing returning echoes detected by the counter that were displayed on an oscilloscope interfaced with the counter, then compared our manual count to that of the Bendix count and adjusted (calibrated) the ping rate until a relative error less than 10% was achieved. Our calibrations at the Kasilof River are 10 minutes in duration or until we attained an oscilloscope count of at least 100 fish, whichever came first. If the counters undercounted, we increased the ping rate and conversely slowed the pulse ping rate if the counters over-counted. We calibrated the counters between 0700 and 0100 on the Kasilof River and required a minimum (total) calibration time of 2 hours per bank per day when the passage rate exceeded 500 fish per hour. We usually intensified our efforts during episodic periods of high fish passage.

The power output or receiver sensitivity, critical in target detection, was set early in the run, at a typical historical level and was not adjusted for calibration purposes. If we extended or shortened the counting range substantially, sensitivity was adjusted up or down to improve target detection if necessary. The sensitivity for each counter was set to maximize detection of migrating fish and limit background noise that can hinder target detection. The spatial distribution of fish from the transducer, based upon sector counts, was used to determine the best counting range.

Occasionally we get sector/hour counts that we consider debris and is not the true passage for that particular sector or time. Such false counts are often caused by river debris that gets stuck in the sonar beam for extended periods of time or can be caused by spawning salmon. False counts are edited from the daily totals when the counts are obviously higher (or lower) than previous hourly or sector counts and/or were observed by a technician. Hourly sonar counts by day were entered into a Microsoft Excel database program that calculated a daily average hourly count for each sonar sector (C_a) by

$$C_a = \frac{C_b}{N}$$

where:

C_b = sum of adjacent, valid hourly sector counts; and

N = number of adjacent sector per hour units that contained only valid counts.

The average was substituted by the database program into any sector/hour block(s) where counts were deleted. Field technicians determined (mostly through direct observation) which counts should be deleted (debris) while finalizing the daily passage estimate. After interpolating missing values, hourly sonar counts (N_h) were summed to estimate total daily escapement (N_d),

$$N_d = \sum N_h .$$

DIDSON OPERATIONS

In 2009, DIDSON salmon escapement estimates were used for management on the Kenai River, but the daily estimates were converted back to Bendix-equivalent units. This was necessary because the current escapement goal, run forecasts, and brood tables were based on historical Bendix escapement estimates. On the Yentna River, DIDSON was used to estimate total daily salmon (all species) escapement, but sockeye salmon escapement estimates were not used for management due to uncertainty in species apportionment. On the Kasilof River, we continued comparing DIDSON estimates against Bendix counts on both banks. Preliminary results indicated differences between the 2 methods were not substantial, and we expect to transition to DIDSON in 2010.²

DIDSON operated on 1 of 2 frequencies; 1.8 MHz with an acoustic beam consisting of 96, 0.3° x 14° beams with a range limit of 10 m; or 1.1 MHz with an acoustic beam consisting of 48, 0.4° x 14° beams and a range limit of 30 m. Laptop computers collected DIDSON data and created image files used to estimate hourly fish passage. The data were stored and backed up on an external hard drive and DVDs. An automated rotator (Hydroacoustics Technology Inc.) coupled with an attitude sensor (*Geomechanics*) ensured proper aim. DIDSON creates video-like images on a computer screen that are manually counted. Auto counting methods have been tested for DIDSON but are not very accurate (Suzanne Maxwell, Commercial Fisheries Biologist, ADF&G, Soldotna; personal communication).

To determine the best aim, we followed the aiming protocol of Maxwell and Smith (2007). The position of the DIDSON nominal beam angle and range were entered into a Microsoft Excel spreadsheet that calculated and graphed the river profile. We overlaid a model of the sonar beam over the profile, adjusted the height of the transducer above the river bottom and estimated the best ‘fit’, or angle for the desired range of the beam. Initially, we used the calculated angle to adjust the rotator and aim of the transducer as detected by the sensor. To check the angle and aim, we moved an artificial target with an acoustic strength similar to that of an average size salmon along the river bottom ~2 m in front of the transducer and through the acoustic beam. Once we established proper aim, we relied on the pitch and roll data recorded from the attitude sensor to maintain that aim, particularly when the DIDSON had to be moved or cleaned. Silt buildup behind the DIDSON lens was a problem and needed to be cleaned once every 2 weeks on the Kenai River and once every 2 or 3 days on the Yentna River to maintain signal strength integrity and visual acuity.

We deployed all DIDSON transducers on an aluminum H-shaped mount in about 0.6 m of water and ~15 cm above the bottom in a horizontal position on each bank. The sensor was mounted to

² Details of the methods and results are being documented by Suzanne Maxwell, Commercial Fisheries Biologist, ADF&G, Soldotna in a separate report.

the transducer that was mounted to the rotator. The DIDSON transducer was placed immediately upstream of a short weir (~6 m wide) approximately 1–1.5 m from the offshore end.

The computer recorded two, 10-minute image files, one for nearshore (0.4–10 m) target detection and the other for offshore (10–30 m) target detection. The nearshore data, set at high frequency, were typically recorded at 8 frames per second while the offshore data, using low frequency, recorded at a frame rate of 6 frames per second.

We counted the DIDSON files throughout the day, so final daily estimates were available for distribution by 0800 the next morning. To process and count the raw images as quickly and accurately as possible, we often hid the background from view using a DIDSON algorithm, leaving only moving fish-like objects against a black background. For counting purposes, we adjusted the intensity level (40 dB \pm), threshold levels (~4–5 dB) and frame rate to ensure counting ease and accuracy. Playback frame rates (variable at 8–30 frames/s) were dependent on fish density and were suited to an individual's ability to differentiate and count fish. Intensity and threshold were relatively constant from person to person with small variations between individuals for personal preference. After the parameters were set for processing data, we counted all moving targets (fish) as observed on the computer screen, differentiating upstream from downstream swimming fish. All hourly estimates were recorded on an Excel spreadsheet and summed for daily estimates.

We manually counted, or subsampled, 10 minutes (T) of fish passage every hour, deducted all downstream-moving fish (n_d) from upstream-moving fish (n_u) observed during the subsample, then expanded the count to an hourly estimate (N_h),

$$N_h = \frac{(n_u - n_d)}{T}$$

We then summed all estimates (N_h) from 0000 to 2300 to estimate daily escapement (N_d),

$$N_d = \sum N_h.$$

We decreased the DIDSON sub-sample estimates by 68% for the Kenai River north bank and 28% for the south bank to convert to a ‘Bendix-equivalent’ number because of differences between DIDSON and Bendix counts. These differences were determined from comparison studies conducted on the Kenai River between 2004 and 2007 (Suzanne Maxwell, Commercial Fisheries Biologist, ADF&G, Soldotna; personal communication). We did not adjust DIDSON estimates to ‘Bendix-equivalents’ on the Yentna River because the previous Bendix-based Yentna River sockeye salmon SEG was removed in 2009 (Fair et al. 2009).

ESTIMATING SOCKEYE SALMON PASSAGE AND AGE COMPOSITION

We operated fish wheels at all UCI sonar sites in 2009 to (1) apportion sonar counts by species when necessary and (2) collect ASL information. Fish wheels were located along the north bank of the Kenai River, north bank of the Kasilof River, south bank of the Crescent River (when operational), and on both banks of the Yentna River. Our criteria for apportioning species from the Kenai and Kasilof rivers is when the fish wheel species composition contains at least 5% of a species other than sockeye salmon and in our best judgment the 5% (or better) is a trend. This guideline was developed mainly to accommodate situations where run timing of sockeye and pink salmon (and sometimes coho salmon) overlap on even-numbered years. We typically apportioned sonar counts by species on the Kenai River during August of even-numbered years.

We have seldom apportioned sonar counts by species on the Kasilof River, because other species were typically a very small component of the fish wheel catch. On the Yentna River, daily fish wheel catches have always been used to apportion daily sonar counts by species. In 2009, the first year of a 4-year fish wheel selectivity study, we operated each of the Yentna River fish wheels for nearly 18 hours/d during 3 time periods, (0600–1200, 1200–1800, and 1800–2359). As mentioned earlier, we did not operate the Crescent River sonar project in 2009.

Total sonar escapement estimates were apportioned to species beginning 19 July on the Kenai River and 9 July on the Kasilof River due to an unexpected large passage of pink salmon. At these sites, daily sockeye salmon escapement was estimated by multiplying the total daily sonar count (all species) by the daily proportion of sockeye salmon in fish wheel catches.

On the Yentna River, we estimated minimum and maximum sockeye salmon escapement because the species selectivity of fish wheels used to apportion total sonar counts to species was uncertain. We think Yentna River fish wheels have been species selective so we calculated 7 apportioned estimates for each species of salmon to derive a daily minimum and maximum migration range for each species. We first calculated 6 daily sockeye salmon escapement estimates ($NS_{d(i)}$) using 6 sets of fish wheel selectivity coefficients (Table 1) from the Susitna (ADF&G 1983) and Taku (Meehan 1961) rivers,

$$NS_{d(i)} = \left(\frac{\frac{F_{(rs)}}{C_{i(rs)}}}{\left(\frac{F_{(rs)}}{C_{i(rs)}} \right) + \left(\frac{F_{(ps)}}{C_{i(ps)}} \right) + \left(\frac{F_{(cs)}}{C_{i(cs)}} \right) + \left(\frac{F_{(ss)}}{C_{i(ss)}} \right)} \right) N_{d(b)}$$

where:

$F_{(rs)}$ = Fish wheel catch of sockeye salmon

$F_{(ps)}$ = Fish wheel catch pink salmon

$F_{(cs)}$ = Fish wheel catch chum salmon

$F_{(ss)}$ = Fish wheel catch coho salmon

$C_{i(rs)}$ = the ith fish wheel selectivity coefficient for sockeye salmon

$C_{i(ps)}$ = the ith fish wheel selectivity coefficient for pink salmon

$C_{i(cs)}$ = the ith fish wheel selectivity coefficient for chum salmon

$C_{i(ss)}$ = the ith fish wheel selectivity coefficient for coho salmon

$N_{d(b)}$ = total daily sonar estimate by bank

A seventh sockeye salmon escapement estimate was also derived assuming no fish wheel selectivity. The minimum and maximum of these 7 estimates were reported on the ADF&G website.

We collected ASL data from 0.1% of the previous day's sockeye salmon passage estimate from the Kenai River and 0.2% of the Kasilof River passage. The sampling plan for the Yentna River was to collect ASL information and genetic samples from all sockeye salmon captured on the north bank and from every sixth sockeye salmon captured on the south bank during each of three 2-hr (genetic) sampling periods. We also measured lengths ($n=400$) of pink, chum, and coho salmon captured in the Yentna River fish wheels.

CESSATION CRITERIA

We ended sonar operations when daily sockeye salmon (apportioned) counts met our cessation criteria, which was $\leq 1\%$ of the cumulative count of sockeye salmon for 3 consecutive days. The cessation criteria for the Kenai and Kasilof River sonar enumeration projects cannot be applied until after August 15, when commercial fishing closes in the fishing sections and subdistricts closest to those rivers. We have made exceptions to this criterion if budgetary constraints and/or environmental factors such as high water put equipment and personnel at risk; although in all exceptions we remained close to the 1% cessation criteria.

CLIMATOLOGICAL

We collected water and air temperatures, depth (staff gauge), and noted general weather conditions, at each of the sites. Because of varying water clarity, we also recorded turbidity (secchi disc) every day in the Kenai River. In the Kasilof and Yentna rivers, turbidity was less variable and therefore, not collected.

RESULTS

KENAI RIVER

This year was different than most odd numbered years because of the high abundance of pink salmon returning to the Kenai River. Beginning 19 July our sonar counts were apportioned among salmon species because of an unusually high fish wheel catch of pink salmon. Our final apportioned sonar count for the Kenai River was 745,170 sockeye, 17,765 pink, (2.3%) and 5,155 coho salmon (Tables 2 and 3). These account for about 19% of the UCI total run estimate of 3.9 million sockeye salmon and 31% of the estimated run of 2.4 million to the Kenai River (Mark Willette, Commercial Fisheries Biologist, ADF&G Soldotna; personal communication).

We counted >80% of the sockeye salmon passage within 22 days, 5 days less than the 16 year historical mean, with the midpoint occurring on 20 July (Table 4), 4 days earlier than the 16 year historical mean. Several substantial peaks in the daily passage rate occurred with the largest on 16 July when >56,000 sockeye salmon passed the counters (Figure 2).

Run timing was similar for both banks and there was no substantial abundance difference between banks (47% north bank) throughout the migration (Table 5; Appendix A1 and A2). Typically, fish migrate farther from shore along the north bank where water level and lower velocity has greater influence on spatial distribution than the south bank. Our DIDSON estimates indicated 84% of the fish (Table 6) were within 10 m of the north bank transducer and 97% within 10 m of the south bank transducer.

The daily trends in hourly passage rate were relatively similar between the north and south bank (Figure 3, Appendices A3–A4). Salmon passage rates along the north bank met or exceeded an average daily rate of 4.2% between 1100 and 2300 (~61% of the average daily estimate) and were lowest between 0100 and 0600. A similar pattern of fish passage occurred on the south bank, meeting or exceeding 4.2% between 1200 and 2300 when ~74% of the fish migrated past the counter.

Our fish wheel catch (Table 7) consisted almost entirely of sockeye salmon (93.9%) with a few pink (5.0%) and coho salmon (0.7%) intermixed. The predominance of sockeye salmon in the

catch is typical but the percentage of pink salmon for an odd year is nearly 4 times higher than the historical mean (Table 8).

We sampled 701 sockeye salmon for ASL analysis (Table 9) out of a total fish wheel catch of 1,435 fish. The largest age components of the sockeye salmon passage were 1.3 (72.6%), 2.2 (9.8%) and 2.3 fish (9.7%). Average lengths and male-to-female ratios (0.7:1) were within historical bounds (Table 10).

In 2009, water level rose steadily in July (1.1 m), peaking at the end of the month (Table 11), causing water clarity to decline substantially during much of that time frame (Figure 4). Water temperature was slightly cooler than average.

KASILOF RIVER

Beginning 9 July sonar counts were apportioned among salmon species because of an unusually high (fish wheel) catch of pink salmon. Our final apportioned sonar count for the Kasilof River was 297,125 sockeye salmon, 4,763 pink salmon and 238 chum salmon (Table 12). Coho and Chinook salmon also spawn within the Kasilof River drainage but were not present in the fish wheel catch. The sonar count was about 36% of the run estimate of 817,000 sockeye salmon and about 8% of the total run (3.9 million) to UCI (Shields 2010).

We counted 80% percent of the passage in a 41-day period (Table 13) with the midpoint occurring on 15 July, one day later than the historical average (1979–2008). We had 1 substantial peak in the sockeye salmon passage that occurred on 15 July when 20,909 fish were counted (Figure 2). Lesser, distinct peaks of between 10,000 and 13,000 fish occurred on 1 July, 11 July, 19 July, and 27 July. Approximately 74% of the fish were counted on the north bank, the highest documented for that bank, and nearly 20% higher than the historical average (1979–2008; Table 5, Appendices B1–B2).

Hourly run timing differed at times for both banks (Appendices B3–B4). The counts for both banks had a tendency to increase until late morning when the south bank started a decline before leveling off in the early afternoon (Figure 3). The north bank continued at a relatively high rate (above average) until mid/late evening. We counted the highest proportion (~80%) of fish along the north bank between the hours of 0600 and 2200 (excluding 1900), when counts met or exceeded a constant hourly rate of 4.2%. We counted ~55% of the fish along the south bank from 0500–1000, 1400–1600, and 1900–2000.

Fish were farther offshore on both banks in June and early July, moving inshore as the run progressed and water level increased in late July and August (Appendices B5–B6). We counted >80% of the passage within 4.3 m of the north bank transducer and within 4.8 m of the south bank transducer (Table 6). The Bendix counting range for the north bank varied from 12.8 m in June to 3.4 m on 21 and 22 July and eventually was set at 4.3 m for most of August and late July. The south bank Bendix counting range varied between 12.2 m in June to 3.4 m for most of August.

We caught a total of 1,390 sockeye salmon (96.8%) in the fish wheel, with a few pink (2.9%) and Chinook salmon (0.3%) (Table 14) intermixed. Our fish wheel catch of sockeye salmon was typical for the Kasilof River but was higher than the average for pink salmon since operations began at the site in 1983 (Table 15). We sampled 331 sockeye salmon for ASL data (Table 16) and determined that age 1.3 (60.4%), 2.2 (17.2%), and 2.3 (13.6%), were the predominant age

classes. Average lengths and male-to-female ratios for the major age classes fell within historical bounds with females comprising 52.0% of the sample (Table 17).

Water temperature was slightly cooler than average and the gain in water level was fourth highest documented in the history of the project, rising at a rate of about 1.5 cm per day (Table 11). Environmental factors did not appear to influence run timing although water level influenced fish distribution and fish wheel operations.

YENTNA RIVER

We estimated 43,972–153,910 sockeye salmon, 309,883–665,875 pink salmon, 52,536–330,232 coho salmon, and 23,048–64,553 chum salmon passed the Yentna River sonar site (Table 18). Sockeye salmon passage was 22%–79% of the total sockeye salmon run (196,000) for the Susitna River drainage (Shields 2010).

We estimated that 80% of the salmon passage occurred over a 21-day period with a midpoint of 23 July, one day earlier than the historical (1981–2008) average (Table 19). Our estimates for both banks combined projected 3 distinct peaks (Figure 5) in the sockeye salmon run, the largest on 17 July and 2 lesser on 30 July and 2 August. Fish distribution along the north bank peaked only once on 30 July while the south bank had 2 distinct peaks on 17 July and 2 August. Pink salmon estimates were highest on 3 August, chum salmon on 8–9 August and coho salmon on 4 August. Pink, coho and chum salmon passage had substantially declined and we are reasonably confident that the passage for these species was past their respective peaks and waning by 12 August.

We apportioned 4–5 times as many sockeye, nearly twice as many chum, and 2–4 times as many coho salmon from the south bank as compared to the north (Table 20–21, Appendices C1–C2) because of the species composition of the fish wheel catches. Our apportioned estimates for pink salmon show no obvious difference between banks. The DIDSON indicated that salmon passage was shore oriented on both banks throughout the season (Table 6). Our subsample counts indicate ~97% of all fish were within 10 m of the north bank transducer and ~98% within 10 m of the south bank transducer. Daily run timing trends between banks were similar throughout the day (Figure 3). The highest passage rates occurred along the north bank during the hours 1600 through 0300 (67%) and along the south bank between 1100 and 2200 hours (63%; Appendices C3–C4).

The south bank fish wheel catch per unit effort (CPUE) was substantially larger than the north bank fish wheel catch (Tables 22–23), typical for the Yentna River. Our south bank fish wheel CPUE averaged 112.7 salmon per hour (Table 24), the second highest historically for that bank, and consisted mostly of sockeye (6,901), pink (55,213), chum (2,254) and coho salmon (6,569). The CPUE for the north bank fish wheel averaged 87.7 salmon per hour (Table 25), the highest on record for that bank, and consisted mostly of sockeye (1,061), pink (50,671), chum (1,262) and coho salmon (2,363). The percentage of pink salmon in the catch for both fish wheels is the highest documented and is especially noteworthy because pink salmon abundance is typically low during an odd numbered year. Catches from both fish wheels totaled 7,962 sockeye salmon or 6% of the total combined fish wheel catch, the lowest percentage ever documented. We caught a higher percentage of sockeye, chum, and coho salmon in the south bank fish wheel whereas the north bank caught a higher percentage of pink salmon. Also, the north bank fish wheel caught 10 times more non-salmon species, mostly white fish, than the south bank.

Age-1.3 fish are typically the predominant age class for sockeye salmon passage but that was not the case in 2009. The age composition of Yentna River sockeye salmon consisted mostly of 1.2 (33.9%), 1.3 (31.6%), and 2.2 (17.2%) (Table 26). The overall age composition indicated a higher incidence of 2-ocean fish over 3-ocean fish, very unusual for Yentna River sockeye salmon. The average lengths and sex composition fell within historical bounds with females comprising 43.8% of the sample (Table 27).

Yentna River water level fluctuated (up to 1.6 m) during operations, rising when rains fell in the mountains in appreciable amounts or when warm, sunny weather melted the glaciers. Overcast days with little or no precipitation would usually cause the water level to drop. Although we didn't measure turbidity, water clarity averages only a few centimeters.

DISCUSSION

Counting conditions and sonar criteria were within design and operational tolerances of Bendix and DIDSON because: (1) salmon passage was near shore and near the bottom; (2) salmon densities were generally adequate for calibrating Bendix and sub sampling DIDSON; and (3) the size of the fish met minimum threshold requirements of the sonar equipment. For the second consecutive year, the Kenai River passage estimate was less than the minimum inriver goal of 750,000, a goal based on a Kenai River return of 2.4 million fish. The sockeye salmon escapement in the Kasilof River was near the upper end of the OEG range of 150,000 to 300,000. In the Susitna drainage, total sockeye salmon weir counts at Judd and Larson lakes were within the SEG range while the escapement into Chelatna Lake was below (Table 28).

KENAI RIVER

The sockeye salmon sonar escapement estimate for the Kenai River was the 7th lowest this decade. Nearly 90% of these fish returned from parent years (2004 and 2005) that exceeded a million fish and were the fourth and fifth highest escapements on record. The 3 highest documented escapement counts were a result of (1) the Glacier Bay (1987; 1.6 million fish) and (2) the Exxon Valdez oil spills (1989; 1.6 million fish) when commercial fishing was restricted for part of or all of the fishing season and (3) a late return and restrictive management scheme that prevented the harvest of excess fish (2006; 1.5 million fish). Sonar counts of species other than sockeye salmon have limited value as indices of total passage because of (1) run timing of pink and coho salmon that differs from sockeye salmon, and (2) the migration of most Chinook salmon outside the ensonified area and beyond the fish wheel.

Daily run timing (proportional) and fish distribution from shore was typical of past years along both banks in 2009. On the north bank, many fish were offshore (>20 m) for much of the first half of the run before moving closer to shore in late July and August. The north bank is on an inside curve of the river and slopes gently toward the opposite bank. The south bank slope is steeper and deeper and the water velocity much swifter than the north bank, forcing fish to stay closer to shore throughout the run. When collecting 10-minute subsamples at a range of 10–30 m from the south bank transducer, the crew noted that the majority of fish within that range were within 10–20 m and the few fish observed beyond 20 m looked (size) like Chinook salmon (Only 3% of the total hourly subsample was counted between 10 and 30 m). Our south bank site has always been a popular sport fishing hole for fishermen angling for Chinook salmon and the outer range of 20–30 m is where many boats back-troll for them. We made similar offshore observations on the south bank in 2008 (Westerman and Willette 2010b). The river bottom

profile on both banks has not changed substantially since the ADF&G started using the site in the mid-1960s.

Fish wheel catches have consistently been $\geq 95\%$ sockeye salmon during odd-numbered years when pink salmon numbers are typically low. In 2009 however, the percentage of pink salmon in the fish wheel catch was nearly 4 times greater than the historical mean for odd years so beginning 19 July, we began apportioning other species from the sonar estimate once pink salmon consistently met or exceeded the apportionment criteria (5%). Not only were high numbers pink salmon in the fish wheel catch unexpected, but they arrived earlier than usual. Typically, pink salmon arrive in August during even-numbered years and not mid-July like they did in 2009.

The proportion of the freshwater age-1 (~80%) and age-2 components (~20%) fell within historical bounds for the Kenai River in 2009 as did average lengths, which were slightly larger than the historical average. Male to female ratios were also within historical bounds.

Escapements of sockeye salmon into spawning streams within the Kenai River drainage were also enumerated by the ADF&G Division of Sport Fish (DSF) on the Russian River and by Cook Inlet Aquaculture Association (CIAA) on Hidden Creek (Table 28). The late-run escapement of sockeye salmon to the Russian River fell within the SEG range of 30,000–110,000 fish while the Hidden Lake escapement of 11,000 fish was far below its desired goal of 30,000 fish (<http://ciaanet.org/Hatcheries>; *Trail Lakes Annual Management Plan*). Personnel from ADF&G Division of Commercial Fisheries (DCF) surveyed Quartz and Ptarmigan creeks in 1 day when the spawners were relatively abundant and the number of dead, spawned-out salmon was low (10–30%). Counts for both creeks were undoubtedly conservative because (1) not all fish had entered the creek judging from the number of jumping salmon we observed at the mouth of each creek, (2) fish in deep holes were difficult to observe, and (3) we cannot reliably account for early or late spawning activity. We've never had a very good relationship (r^2 values <0.25) between these survey/weir counts and our sonar estimates (Westerman and Willette 2010a).

We did not notice any obvious environmental effects on run timing. When water level rises, especially at an accelerated rate, water clarity tends to decrease until water levels stop increasing or decline. Water clarity tends to affect fish wheel efficiency more than it affects sonar operations, particularly during the day. Fish are more susceptible to fish wheel capture when the water is turbid, and less susceptible when relatively clear.

Supporting data are provided in Appendix A.

KASILOF RIVER

The Kasilof River sockeye salmon count of 297,125 was the lowest since 2002 and seventh lowest for this decade. However, the final count was still ~3,000 fish less than the upper end of the OEG.

We consider sonar passage estimates to be imprecise for pink, coho, and Chinook salmon because of differences in run timing, sonar counter limitations (traveling beyond the ensonified range: Chinook salmon), and spawning locations in relation to the sonar site. Pink salmon have been historically a small (~1–2%) component of the fish wheel catch (~1–2%). However, in 2009, we had an unusually high catch of pink salmon that met our apportionment criteria by 9 July. The large run of pink salmon in 2009 was unusual because it occurred during an odd-

numbered year and began early in the season. We discontinued apportioning from the sonar counts after fish wheel operations ended because pink salmon had been absent from the catch for 4 consecutive days (one pink salmon caught in previous 4 days) and the escapement was about 85% complete. An unexpected large return of pink salmon also occurred in the Kenai and Yentna rivers. The majority of coho salmon enter the river in August, usually after sonar operations have ceased and, therefore, were not a significant part of the fish wheel catch. The historical proportion of Chinook salmon in the fish wheel catch has been small, ranging between 0.01% and 5.1%. Fish wheel location, river current, depth or other unknown environmental factors could be influencing Chinook salmon migration patterns at this site.

Fish orientation and spatial distribution from shore were typical of sockeye salmon migration at the Kasilof River sonar site, spreading out evenly throughout much of the counting range into early July as water level slowly increased, then moving inshore as the water level neared its seasonal peak. By the second week of July, at least 80% of the fish passed within the nearshore half of the counting range along each bank.

Prior to 2005, we positioned the fish wheel under the Sterling Highway bridge where the fish wheel CPUE was adequate in June and July but consistently low in August. We attributed the low CPUE to high water, a swift current, and a sloping, near-shore substrate consisting of large rocks (many >50 cm) that impairs fish wheel efficiency. (Water level and velocity peaks in August). If the current is too swift, the fish wheel spins too quickly and is prone to dumping captured fish back into the river. Beginning in 2005, we located the fish wheel approximately 20 m upstream of the bridge where the water was shallower and slower, and the substrate flatter with smaller (~10–40 cm) rocks. Unfortunately, shallow water early in the season was inadequate for turning the fish wheel. In 2009, we initially positioned the fish wheel under the bridge and were able to operate more effectively in June but then relocated the fish wheel to the upper site in mid-July when the water level was higher. A declining CPUE and risk to equipment and personnel because of high water and river debris (trees) forced us to end fish wheel operations on 31 July. Our CPUE was less than average in 2009 but satisfied our minimum requirements for ASL samples, particularly early in the season. The most efficient time for catching fish was late evening and night.

The Kasilof River is a glacial river originating from Tustumena Lake that rises steadily throughout the summer season. Rainfall contributed substantial amounts of water to the river in 2009 and complicated operations in late July and August.

Supporting data are provided in Appendix B.

CRESCENT RIVER

Redoubt volcano erupted in 19 distinct events between 22 March and 4 April, 2009 (<http://www.avo.alaska.edu/volcanoes/>). Seismicity remained elevated between April and June causing the Alaska Volcano Observatory (AVO) to issue warnings/watches about potential explosive activity. Redoubt volcano was downgraded on 30 June to an advisory alert level code yellow as seismic activity declined. Despite the downgrade in activity level, the volcano remained at a level of “elevated unrest” throughout the summer.

The unrest and uncertainty of volcanic activity was reason for cancelling the Crescent River project, where the sonar site is only 18 air miles (29 km) from the caldera. During 2 of the eruptions in March and April, considerable amounts of volcanic ash fell along the Crescent River

between Cook Inlet and the south fork. We decided not to operate the project at the annual area staff meeting in May, 5–6 weeks before activity was downgraded.

Anecdotal evidence and an (aerial) inspection of Crescent Lake spawning streams indicated that a good escapement of sockeye salmon probably exceeded the minimum escapement goal. We estimated escapement at 125,114 using the mean (2001–2008) harvest rate (Mark Willette, Commercial Fisheries Biologist, ADF&G, Soldotna; personal communication), and total run at approximately 183,000 sockeye salmon in 2009. See Table 2 for historical passage data.

YENTNA RIVER

For the first time, we strictly used DIDSON on the Yentna River to estimate the probable range of sockeye salmon escapement given uncertainty about fish wheel selectivity and the subsequent apportionment of total sonar counts to species. The DIDSON sockeye salmon estimates were not used for inseason management because the previous Bendix-based Yentna sockeye salmon SEG was replaced by 3 new weir SEGs (Fair et al. 2009). The probable range of sockeye salmon escapement was reported daily inseason to provide an indication of run timing and uncertainty in the estimates. The fish wheel selectivity coefficients used to calculate the 6 different ranges of sockeye salmon escapement were obtained from studies on the Susitna (ADFG 1983) and Taku (Meehan 1961) rivers over 20 years ago. Since fish wheel selectivity is likely site specific (i.e., dependent on the location and design of the fish wheel), we could not identify any one of the 6 sets of selectivity coefficients that would be most appropriate for the Yentna fish wheels. Therefore, in 2009 we initiated an AKSSF tagging study to estimate the species selectivity of the Yentna fish wheels using methods similar to Meehan (1961). Additionally in a separate AKSSF study, we began investigating errors in our total DIDSON salmon abundance estimates resulting from fish passing beyond the beam offshore and above the beam nearshore. We also began studies to determine whether we can apportion total DIDSON salmon estimates to species or groups of species using length measurements of salmon in DIDSON images.

Historically, we have not considered the final apportioned estimates for other salmon to be representative of their true run strength because the time frame for operating the sonar project has always been set to match sockeye salmon run timing and not the timing of all species. Factors influencing the accuracy of passage estimates for pink, coho, chum, and Chinook salmon in the Yentna River have been discussed by Tarbox et al. (1981, 1983). For some years however, our escapement ranges for these species were likely indicative of run timing trends. In 2009, it appeared that pink and coho salmon runs were nearly complete (<3% for 3 consecutive days) by 12 August, and the chum salmon run was declining (<10%). For an odd-numbered year, the high abundance of pink salmon throughout the operational period was unusual.

Based on the fish wheel catches for each bank, a higher percentage of sockeye, coho and chum salmon were apportioned from the south bank estimates than the north bank, whereas more pink salmon were apportioned from the north bank estimates. This difference is consistent with historical fish wheel catches.

The effectiveness of operating a fish wheel can be influenced by several environmental factors such as river size, depth, bottom profile, substrate type, current, turbidity, fish size and behavior, and non-environmental issues such as size and configuration of the fish wheel. Private land along the river adds to the problems of operating a fish wheel because of the need to anchor the equipment to shore. Because of these factors, there are challenges to operating fish wheels on the Yentna River are many. The river is 200–240 m wide at the sonar site and the volume of

water and constant fluctuations in water level must be dealt with daily. The bottom profile near the south bank fish wheel site is relatively steep dropping 0.25 m in depth per m in range (April Faulkner, Commercial Fisheries Biologist, ADF&G, Soldotna; personal communication) causing a gap of about 0.5 m at the offshore side of the fish wheel. This gap could allow some fish to swim under the rotating basket. Bottom profile information is not available for the north bank fish wheel. Sockeye, pink, chum, and coho salmon are generally bank-oriented, but it is likely that different species exhibit different migratory orientations from shore. If pink salmon for example, swim nearer shore, they may be more susceptible to the fish wheel than larger fish that pass farther from shore. Peculiarities like this might increase or decrease the capture probability for each species, violating our previous assumption of equal capture probability among species.

We examined fish wheel efficiency related to our sonar counts and concluded that when water level increased, Bendix sonar counts generally decreased. Davis (1997) found that the Yentna River south bank fish wheel efficiency was high when Bendix sonar counts were low, suggesting that the south bank counter was undercounting based on fish wheel catches. Westerman and Willette (2007a-b) found that fish wheel efficiency was significantly positively correlated ($p < 0.05$) with water level in 4 years (2002–2005) on the south bank and in 2 of 4 years on the north bank. These patterns were consistent with a change in fish behavior during periods of high water, causing fish to be more vulnerable to the fish wheel. Yentna River water level frequently fluctuates 5–10 cm every day, and during extensive rainy periods, fluctuations can exceed one meter. Variable water level likely affects the species selectivity of fish wheels, since all fish likely travel closer to shore during high water to avoid strong currents offshore. Since all species may be more vulnerable to capture under these conditions, species selectivity may be more similar.

In 2009, we began a 4-year study to estimate Yentna fish wheel selectivity by applying dart tags to pink, sockeye, chum, and coho salmon caught in the lower Susitna River (Flathorn Station) and recapturing some of these tagged fish in the Yentna fish wheels. This study was designed to test for differences in recapture probability among species and over time, i.e. within and among years. If we find that recapture probabilities vary over time, then we will attempt to model recapture probabilities in relation to water level and salmon abundance to more reliably adjust historical estimates. Proposed DIDSON studies will also allow us to examine changes in the onshore-offshore distribution of different sized salmon related to water level and other factors. The results from these studies will not be published until after the projects end in 2012. However, preliminary results from the 2009 Yentna River fish wheel selectivity study indicate that the Yentna fish wheels have the highest selectivity for pink salmon. Similar studies found that fish wheels were more efficient in capturing smaller Chinook salmon from the Taku River, while coho and larger Chinook salmon were least susceptible to recapture by the fish wheel and pinks were the most easily captured (Meehan 1961). Another tagging study conducted on the Susitna River in 1981 and 1982 (ADF&G 1983) indicated that fish wheels at Talkeetna and Curry Stations had lower selectivity for chum and Chinook salmon, moderate selectivity for coho and sockeye salmon, and highest selectivity for pink salmon.

The Yentna River is highly turbid in the summer with visibility <15 cm at the surface. The Yentna River fish wheel CPUE is 2 to 8 times greater than those at other UCI sites, which we attribute partly to the highly turbid nature of the Yentna River. Fish wheel CPUE improves at night or twilight at other UCI sites because of reduced visibility. While river turbidity improves fish wheel CPUE, silt deposits impair performance of the sonar lens, requiring frequent cleaning.

Heavy silt loads also cause acoustic attenuation problems, reducing target detection at longer ranges. In some years, high water has been a problem that either put a temporary end to operations or forced us to end operations in August before cessation criteria were met. Fortunately, this did not occur in 2009.

Stream surveys (aerial and ground) and weir counts (Tables 29 and 30) were also conducted on a number of streams and lakes in northern Cook Inlet by ADF&G and CIAA. CIAA operated weirs on Chelatna, Judd, Shell, Larson, Red Shirt, Trapper, and Fish lakes, providing escapement counts for historical sockeye salmon spawning areas (Tarbox and Kyle 1989) within the Susitna River drainage.

Supporting data are provided in Appendix C.

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TABLES AND FIGURES

Table 1.—Fish wheel selectivity coefficients for sockeye, pink, chum and coho salmon estimated on the Susitna River.

Species	Fish Wheel Selectivity Coefficients					
	1	2	3	4	5	6
Sockeye	0.072	0.134	0.127	0.087	0.033	0.009
Pink	0.119	0.186	0.174	0.164	0.079	0.083
Chum	0.060	0.052	0.083	0.046	0.022	0.018
Coho	0.147	0.110	0.114	0.065	0.007	0.007
Study area:	Talkeetna Sta -1981	Talkeetna Sta -1982	Curry Sta- 1981	Curry Sta- 1982	Taku R-1958	Taku R-1959

Sources: ADF&G 1983 in 1981–1982 (coefficients 1–4) and Taku River; Meehan 1961 in 1958–1959 (coefficients 5–6).

Note: Fish wheel selectivity coefficients are tag recapture probabilities, i.e., proportions of the number of recovered tags to the total number of tagged fish released.

Table 2.—Sockeye salmon passage estimates in the Kenai, Kasilof, Crescent, Yentna, and Susitna Rivers, 1978–2009.

Year	System					
	Kenai R. ^a	Kasilof R. ^b	Crescent R. ^c	Yentna R. ^d	Susitna R	Susitna/Yentna R.
1978	398,900	116,600	ND	ND	94,400	ND
1979	285,020	152,179	86,654	ND	156,890	ND
1980	464,038	184,260 ^e	90,863	ND	190,866	ND
1981	407,639	256,625	41,213	139,401	340,232	ND
1982	619,831	180,239	58,957	113,847	189,772 ^f	215,856 ^g – 265,332 ^h
1983	630,340	210,271	92,122	104,414	112,314	176,114 ^h
1984	344,571	231,685	118,345	149,375	ND	194,480 ⁱ – 279,446 ^h
1985	502,820	505,049	128,628	107,124	ND	227,924 ^h
1986	501,157	275,963	20,385 ^j	92,076	ND	ND
1987	1,596,871	249,250	120,219	66,054	ND	ND
1988	1,021,469	204,000 ^k	57,716	52,330	ND	ND
1989	1,599,959	158,206	71,064	96,269	ND	ND
1990	659,520	144,136	52,238	140,290	ND	ND
1991	647,597	238,269	44,578	109,632	ND	ND
1992	994,798	184,178	58,229	66,074	ND	ND
1993	813,617	149,939	37,556	141,694	ND	ND
1994	1,003,446	205,117	30,355	128,032	ND	ND
1995	630,447	204,935	52,311	121,220	ND	ND
1996	797,847	249,944	28,729	90,660	ND	ND
1997	1,064,818	266,025	70,768	157,822	ND	ND
1998	767,558	273,213	62,257	119,623	ND	ND
1999	803,379	312,587	66,519	99,029	ND	ND
2000	624,578	256,053	56,599	133,094	ND	ND
2001	650,036	307,570	78,082	83,532	ND	ND
2002	957,924	226,682	62,833	78,591	ND	ND
2003	1,181,309	359,633	122,457	180,813	ND	ND
2004	1,385,981	577,581	103,201	71,281	ND	ND
2005	1,376,452	348,012	125,623	36,921	ND	ND
2006	1,499,692	368,092	92,533	92,896	ND	ND
2007	867,572	336,866	79,406	79,901	ND	ND
2008	614,946	301,469	62,030	90,146	ND	ND
2009	745,170	297,125	ND	44,248–153,910	ND	ND

Note: DIDSON used on the Kenai River beginning in 2007 (south bank) and 2008 (both banks), and Yentna River beginning in 2009. Bendix sonar used prior to those years.

^a Counting began 22 June, 1978–87, and 1 July 1988–02.

^b Includes counts or estimates prior to 15 June (1978–88) and post enumeration estimates (1981–1986).

^c Did not conduct project in 2009 because of volcanic activity.

^d The range for 2009 is based on DIDSON estimates; apportionment range determined from 1 of 7 possible fish wheel catch coefficients.

^e Estimate revised November 2003 from 187,154.

^f Combines sonar counts from Yentna and Sunshine stations.

^g Mark–recapture estimates from Sunshine Station added to sonar counts from west bank, Susitna River.

^h Counts from Yentna Station and mark-recapture estimate from Sunshine Station.

ⁱ Combined counts from Yentna Station and east bank, Susitna Station.

^j Counts through 16 July only.

^k Combined counts from weirs on Bear and Glacier Flat Creeks and surveys of remaining spawning streams (sonar count was 151,856).

Table 3.—Salmon passage estimate into the Kenai River, 1 July–13 August, 2009.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	2,645	2,645	0	0	0	0	0	0
2 Jul	3,313	5,958	0	0	0	0	0	0
3 Jul	3,567	9,525	0	0	0	0	0	0
4 Jul	5,304	14,829	0	0	0	0	0	0
5 Jul	4,750	19,579	0	0	0	0	0	0
6 Jul	4,436	24,015	0	0	0	0	0	0
7 Jul	6,118	30,133	0	0	0	0	0	0
8 Jul	4,607	34,740	0	0	0	0	0	0
9 Jul	5,944	40,684	0	0	0	0	0	0
10 Jul	5,192	45,876	0	0	0	0	0	0
11 Jul	7,836	53,712	0	0	0	0	0	0
12 Jul	19,377	73,089	0	0	0	0	0	0
13 Jul	11,989	85,078	0	0	0	0	0	0
14 Jul	20,325	105,403	0	0	0	0	0	0
15 Jul	50,442	155,845	0	0	0	0	0	0
16 Jul	56,461	212,306	0	0	0	0	0	0
17 Jul	52,395	264,701	0	0	0	0	0	0
18 Jul	36,327	301,028	0	0	0	0	0	0
19 Jul	26,151	327,179	2,515	2,515	0	0	0	0
20 Jul	45,211	372,390	2,380	4,895	0	0	0	0
21 Jul	28,062	400,452	956	5,851	0	0	0	0
22 Jul	8,889	409,341	1,160	7,011	0	0	0	0
23 Jul	11,201	420,542	0	7,011	0	0	0	0
24 Jul	16,007	436,549	616	7,627	0	0	616	616
25 Jul	8,064	444,613	1,710	9,337	0	0	0	616
26 Jul	10,864	455,477	1,932	11,269	0	0	0	616
27 Jul	36,476	491,953	0	11,269	0	0	0	616
28 Jul	40,078	532,031	0	11,269	691	691	0	616
29 Jul	32,129	564,160	755	12,024	0	691	0	616
30 Jul	26,747	590,907	530	12,554	0	691	0	616
31 Jul	27,370	618,277	338	12,892	0	691	0	616
1 Aug	17,878	636,155	576	13,468	577	1,268	0	616
2 Aug	20,429	656,584	1,237	14,705	1,858	3,126	0	616
3 Aug	22,400	678,984	0	14,705	1,067	4,193	0	616
4 Aug	13,704	692,688	0	14,705	312	4,505	0	616
5 Aug	11,978	704,666	1,562	16,267	0	4,505	0	616
6 Aug	7,141	711,807	630	16,897	420	4,925	210	826
7 Aug	5,015	716,822	111	17,008	0	4,925	112	938
8 Aug	3,204	720,026	188	17,196	95	5,020	94	1,032
9 Aug	4,586	724,612	269	17,465	135	5,155	135	1,167
10 Aug	6,992	731,604	0	17,465	0	5,155	0	1,167
11 Aug	3,650	735,254	0	17,465	0	5,155	0	1,167
12 Aug	4,256	739,510	129	17,594	0	5,155	0	1,167
13 Aug	5,660	745,170	171	17,765	0	5,155	0	1,167
Percentage:	96.9		2.3		0.7		0.02	
Total Estimate:	769,257							

Note: Estimates for species other than sockeye salmon are incomplete and not indicative of run strength for that species.

Table 4.—Cumulative proportion by date of sockeye salmon passage recorded in the Kenai River, 1993–2009.

Date	Cumulative Proportion																
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
01 Jul	0.004		0.000	0.001	0.003	0.002	0.001	0.003	0.002	0.005	0.005	0.002	0.004	0.001	0.004	0.004	0.004
02 Jul	0.010	0.000	0.001	0.002	0.008	0.007	0.003	0.005	0.010	0.013	0.007	0.005	0.010	0.003	0.009	0.009	0.008
03 Jul	0.013	0.001	0.001	0.003	0.014	0.010	0.004	0.011	0.017	0.018	0.011	0.007	0.015	0.005	0.014	0.013	0.013
04 Jul	0.019	0.001	0.002	0.005	0.021	0.013	0.005	0.016	0.023	0.027	0.017	0.009	0.023	0.006	0.017	0.015	0.020
05 Jul	0.037	0.002	0.003	0.007	0.029	0.017	0.006	0.019	0.028	0.056	0.021	0.010	0.033	0.008	0.020	0.017	0.026
06 Jul	0.058	0.003	0.007	0.010	0.034	0.025	0.008	0.023	0.033	0.083	0.024	0.012	0.042	0.010	0.024	0.018	0.032
07 Jul	0.061	0.007	0.011	0.012	0.037	0.033	0.012	0.029	0.038	0.139	0.027	0.015	0.049	0.013	0.030	0.019	0.040
08 Jul	0.067	0.011	0.013	0.017	0.044	0.041	0.016	0.035	0.046	0.177	0.031	0.019	0.058	0.015	0.039	0.021	0.047
09 Jul	0.081	0.013	0.016	0.019	0.047	0.052	0.022	0.047	0.056	0.201	0.037	0.021	0.078	0.017	0.049	0.025	0.055
10 Jul	0.085	0.016	0.019	0.021	0.068	0.065	0.026	0.060	0.063	0.221	0.045	0.023	0.094	0.020	0.054	0.030	0.062
11 Jul	0.087	0.019	0.021	0.025	0.117	0.071	0.029	0.068	0.070	0.234	0.066	0.024	0.122	0.022	0.059	0.032	0.072
12 Jul	0.092	0.021	0.023	0.029	0.171	0.075	0.032	0.075	0.075	0.241	0.117	0.027	0.157	0.023	0.065	0.035	0.098
13 Jul	0.101	0.023	0.025	0.032	0.233	0.078	0.034	0.115	0.080	0.249	0.151	0.031	0.176	0.025	0.068	0.043	0.114
14 Jul	0.210	0.025	0.032	0.065	0.292	0.083	0.039	0.260	0.096	0.260	0.176	0.113	0.188	0.026	0.073	0.047	0.141
15 Jul	0.301	0.032	0.062	0.213	0.309	0.088	0.049	0.386	0.141	0.285	0.194	0.213	0.198	0.029	0.081	0.089	0.209
16 Jul	0.400	0.062	0.073	0.347	0.346	0.102	0.054	0.459	0.187	0.323	0.270	0.282	0.231	0.038	0.089	0.199	0.285
17 Jul	0.485	0.073	0.122	0.402	0.416	0.150	0.067	0.496	0.251	0.352	0.362	0.317	0.276	0.048	0.095	0.282	0.355
18 Jul	0.517	0.122	0.164	0.435	0.495	0.183	0.097	0.545	0.295	0.398	0.441	0.340	0.313	0.054	0.106	0.313	0.404
19 Jul	0.533	0.164	0.190	0.468	0.501	0.209	0.138	0.584	0.348	0.497	0.501	0.355	0.367	0.058	0.155	0.340	0.439
20 Jul	0.557	0.190	0.232	0.498	0.522	0.231	0.164	0.604	0.389	0.562	0.528	0.362	0.393	0.063	0.173	0.388	0.500
21 Jul	0.582	0.232	0.269	0.531	0.542	0.246	0.200	0.624	0.411	0.596	0.555	0.384	0.409	0.074	0.209	0.440	0.537
22 Jul	0.599	0.269	0.298	0.555	0.552	0.272	0.249	0.643	0.434	0.621	0.612	0.453	0.427	0.095	0.263	0.491	0.549
23 Jul	0.612	0.298	0.343	0.592	0.583	0.333	0.308	0.673	0.466	0.648	0.668	0.474	0.465	0.117	0.308	0.508	0.564
24 Jul	0.624	0.343	0.399	0.640	0.648	0.392	0.360	0.714	0.523	0.676	0.714	0.497	0.506	0.147	0.348	0.527	0.586
25 Jul	0.635	0.399	0.420	0.713	0.659	0.434	0.447	0.752	0.597	0.702	0.740	0.522	0.527	0.180	0.387	0.545	0.597
26 Jul	0.670	0.420	0.428	0.755	0.666	0.460	0.515	0.787	0.676	0.735	0.766	0.552	0.541	0.235	0.441	0.557	0.611
27 Jul	0.720	0.428	0.432	0.774	0.670	0.490	0.589	0.816	0.730	0.747	0.787	0.578	0.549	0.272	0.510	0.584	0.660
28 Jul	0.748	0.432	0.440	0.786	0.674	0.544	0.647	0.842	0.759	0.758	0.820	0.608	0.556	0.311	0.559	0.615	0.714
29 Jul	0.773	0.440	0.450	0.794	0.681	0.602	0.685	0.868	0.782	0.771	0.844	0.633	0.565	0.355	0.595	0.651	0.757
30 Jul	0.795	0.450	0.469	0.801	0.688	0.644	0.713	0.882	0.809	0.783	0.860	0.651	0.588	0.393	0.618	0.693	0.793
31 Jul	0.814	0.469	0.525	0.825	0.694	0.694	0.731	0.893	0.832	0.797	0.875	0.666	0.614	0.426	0.640	0.725	0.830
01 Aug	0.827	0.525	0.620	0.854	0.698	0.766	0.755	0.905	0.854	0.810	0.891	0.675	0.632	0.465	0.663	0.762	0.854
02 Aug	0.845	0.620	0.673	0.877	0.701	0.855	0.779	0.913	0.877	0.825	0.911	0.688	0.643	0.498	0.679	0.790	0.881
03 Aug	0.858	0.673	0.696	0.898	0.705	0.871	0.796	0.927	0.894	0.841	0.928	0.716	0.659	0.526	0.689	0.812	0.911
04 Aug	0.866	0.696	0.713	0.916	0.708	0.882	0.814	0.943	0.914	0.858	0.941	0.748	0.671	0.556	0.704	0.835	0.930

-continued-

Table 4.—Page 2 of 2.

Date	Cumulative Proportion																
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
05 Aug	0.879	0.713	0.728	0.928	0.712	0.894	0.829	0.955	0.928	0.876	0.950	0.769	0.683	0.586	0.725	0.854	0.946
06 Aug	0.908	0.728	0.740	0.938	0.724	0.914	0.845	0.967	0.942	0.891	0.965	0.789	0.710	0.606	0.752	0.871	0.955
07 Aug	0.927	0.740	0.748	0.953	0.737	0.929	0.869	0.976	0.957	0.907	0.976	0.804	0.734	0.621	0.770	0.885	0.962
08 Aug	0.938	0.748	0.757	0.967	0.758	0.943	0.893	0.984	0.971	0.927	0.984	0.813	0.745	0.630	0.785	0.896	0.966
09 Aug	0.959	0.757	0.771	0.982	0.774	0.953	0.912	0.991	0.978	0.952	0.992	0.835	0.753	0.639	0.814	0.908	0.972
10 Aug	0.970	0.771	0.791	0.991	0.784	0.962	0.921	1.000	0.986	0.971	1.000	0.868	0.760	0.647	0.830	0.926	0.982
11 Aug	0.979	0.791	0.814	1.000	0.805	0.974	0.930		0.989	0.984		0.900	0.771	0.657	0.855	0.944	0.987
12 Aug	0.989	0.814	0.835		0.821	0.986	0.944		0.998	0.990		0.934	0.809	0.673	0.881	0.961	0.992
13 Aug	1.000	0.835	0.857		0.841	1.000	0.951		1.000	0.996		0.955	0.854	0.687	0.897	0.973	1.000
14 Aug		0.857	0.874		0.856		0.962			1.000		0.969	0.881	0.700	0.910	0.986	
15 Aug		0.874	0.896		0.868		0.976					0.981	0.912	0.721	0.922	0.995	
16 Aug		0.896	0.914		0.877		0.984					0.988	0.941	0.745	0.934	0.998	
17 Aug		0.914	0.926		0.893		0.992					0.995	0.961	0.767	0.944	1.000	
18 Aug		0.926	0.942		0.906		1.000					1.000	0.973	0.788	0.954		
19 Aug		0.942	0.963		0.919								0.980	0.814	0.966		
21 Aug		0.963	0.977		0.932								0.991	0.839	0.978		
21 Aug		0.977	0.985		0.944								1.000	0.855	0.985		
22 Aug		0.985	0.992		0.956									0.878	0.992		
23 Aug		0.992	1.000		0.970									0.898	1.000		
24 Aug			1.000		0.985									0.912			
25 Aug					1.000									0.927			
26 Aug														0.942			
27 Aug														0.961			
28 Aug														0.978			
29 Aug														0.988			
30 Aug														0.996			
31 Aug														1.000			
Midpoint No. days for 80% ^a	25	31	31	21	39	22	22	20	21	32	22	29	36	33	28	25	22
Average (16 yr): 27	Midpoint Average (16 yr): 24																

^a Inclusive dates: date proportion of passage reached 10% through date proportion reached 90%.

Table 5.—Distribution of sockeye salmon passage by bank (% of total count) in the Kenai, Kasilof, Crescent, and Yentna rivers, 1979–2009.

Year	Kenai River		Kasilof River		Crescent River		Yentna River ^a	
	North	South	North	South	North	South	North	South
1979	72	28	53	47	ND	ND	ND	ND
1980	61	39	52	48	49	51	ND	ND
1981	72	28	69	31	57	43	ND	ND
1982	39	61	73	27	54	46	ND	ND
1983	42	58	51	49	39	61	ND	ND
1984	65	35	56	44	71	28	ND	ND
1985	54	46	70	30	70	30	9	91
1986	62	38	57	43	84	16	32	68
1987	48	52	55	45	64	36	10	90
1988	47	53	32	68	53	47	8	92
1989	57	43	39	61	52	48	12	88
1990	62	38	29	71	44	56	2	98
1991	73	27	39	61	33	67	8	92
1992	60	40	45	55	56	44	5	95
1993	49	51	28	72	41	56	14	86
1994	52	48	47	53	65	35	8	92
1995	52	48	38	62	68	32	11	89
1996	54	46	61	39	68	32	21	79
1997	56	44	41	59	79	21	11	89
1998	55	45	36	64	70	30	49	51
1999	55	45	51	49	53	47	26	74
2000	64	36	51	49	63	37	22	78
2001	50	50	63	37	79	21	38	63
2002	49	51	48	52	74	26	25	75
2003	49	51	50	50	65	35	29	71
2004	49	51	43	57	64	36	6	94
2005	45	55	59	41	65	35	17	83
2006	41	59	67	33	54	46	11	89
2007	50	50	75	25	63	37	16	84
2008	48	52	73	27	60	40	15	85
2009	47	53	74	26	ND	ND	16-19	81-84
Ave. (1979-2008)	51	49	54	46	66	34	21	79

^a Percentages for 2009 is a range based on DIDSON estimates and fish wheel catch coefficients.

Table 6.—Inshore and offshore DIDSON range distribution of fish along both banks of the Kenai and Yentna rivers (top), and Bendix range distribution by sector for both banks of the Kasilof River (bottom), 2009.

DIDSON Range				
	Kenai River		Yentna River	
	North Bank			
	1–10 m		10–30 m	
Subsample count	83,823	15,948	51,341	1,577
% Subsample	84.0	16.0	97.0	3.0
(%) std dev	35.7	35.7	2.2	2.2
(%) var	12.7	12.7	0.0	0.0
(%) min	1.4	0.5	93.9	0.0
(%) max	99.5	98.6	100.0	6.1
South Bank				
Subsample count	84,089	2,573	79,180	1,206
% Subsample	97.0	3.0	98.5	1.5
(%) std dev	7.4	7.4	1.0	1.0
(%) var	0.6	0.6	0.0	0.0
(%) min	74.4	0.1	96.4	0.0
(%) max	99.9	25.6	100.0	3.6

Note: 98% of fish passage occurred within 17 m of the Kenai south bank.

Bendix Range												
Kasilof River												
Sector												
1	2	3	4	5	6	7	8	9	10	11	12	
North Bank												
Daily %	9.8	20.3	18.6	16.7	11.4	10.2	4.5	2.2	2.7	1.3	1.4	0.9
Cum. %	9.8	30.1	48.7	65.4	76.9	87.1	91.5	93.7	96.4	97.7	99.1	100
Ave. (m):	0.7	1.4	2.1	2.9	3.6	4.3	5.0	5.7	6.4	7.2	7.9	8.6
Min. & max. counting ranges:	3.4 – 12.8 m				Dead range: 0.3 – 0.8 m				Std dev: 3.3			
South Bank												
Daily %	8.7	12.7	13.6	13.8	19.1	9.5	3.7	5.2	2.6	3.8	3.5	3.7
Cum. %	8.7	21.4	35.1	48.9	68.0	77.6	81.2	86.5	89.0	92.8	96.3	100
Ave. (m):	0.7	1.4	2.1	2.8	3.5	4.2	4.8	5.5	6.2	6.9	7.6	8.3
Min. & max. counting ranges:	3.4 – 12.2 m				Dead range: 0.3 – 0.8 m				Std dev: 3.2			

Note: Add dead range to counting range to determine total range from transducer.

Table 7.—Daily fish wheel catch by species for the Kenai River, 1 July–13 August, 2009.

Date	Hours Open	Sockeye			Pink			Chum			Coho			Chinook		
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	
1 Jul	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2 Jul	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3 Jul	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4 Jul	22.3	5	5	0	0	0	0	0	0	0	0	0	0	0	0	
5 Jul	22.5	9	14	0	0	0	0	0	0	0	0	0	0	0	0	
6 Jul	31.7	7	21	0	0	0	0	0	0	0	0	0	0	0	0	
7 Jul	19.3	10	31	0	0	0	0	0	0	0	0	0	0	0	0	
8 Jul	21.0	2	33	1	1	0	0	0	0	0	0	0	0	1	1	
9 Jul	22.9	0	33	0	1	0	0	0	0	0	0	0	0	0	1	
10 Jul	19.9	35	68	0	1	0	0	0	0	0	0	0	0	0	1	
11 Jul	24.0	2	70	1	2	0	0	0	0	0	0	0	0	1	2	
12 Jul	14.0	18	88	1	3	0	0	0	0	0	0	0	0	0	2	
13 Jul	20.5	11	99	0	3	0	0	0	0	0	0	0	0	0	2	
14 Jul	11.3	21	120	4	7	0	0	0	0	0	0	0	0	0	2	
15 Jul	6.5	44	164	7	14	0	0	0	0	0	0	0	0	0	2	
16 Jul	2.5	67	231	1	15	0	0	0	0	0	0	0	0	0	2	
17 Jul	4.5	103	334	10	25	0	0	0	0	0	0	0	0	0	2	
18 Jul	4.5	61	395	1	26	0	0	0	0	0	0	0	0	0	2	
19 Jul	2.0	52	447	5	31	0	0	0	0	0	0	0	0	0	2	
20 Jul	1.0	38	485	2	33	0	0	0	0	0	0	0	0	0	2	
21 Jul	4.2	88	573	3	36	0	0	0	0	0	0	0	0	0	2	
22 Jul	6.2	69	642	9	45	0	0	0	0	0	0	0	0	0	2	
23 Jul	2.0	43	685	0	45	0	0	0	0	0	0	0	0	0	2	
24 Jul	2.0	52	737	2	47	0	0	0	0	0	0	0	0	2	4	
25 Jul	7.0	33	770	7	54	0	0	0	0	0	0	0	0	0	4	
26 Jul	18.5	45	815	8	62	0	0	0	0	0	0	0	0	0	4	
27 Jul	2.0	60	875	0	62	0	0	0	0	0	0	0	0	0	4	
28 Jul	0.5	58	933	0	62	0	0	0	0	1	1	0	1	0	4	
29 Jul	0.8	85	1,018	2	64	0	0	0	0	0	1	0	1	0	4	
30 Jul	2.0	101	1,119	2	66	0	0	0	0	0	1	0	1	0	4	
31 Jul	0.0	0	1,119	0	66	0	0	0	0	0	1	0	1	0	4	
1 Aug	1.5	31	1,150	1	67	0	0	0	0	1	2	0	2	0	4	
2 Aug	2.0	33	1,183	2	69	0	0	0	0	3	5	0	5	0	4	
3 Aug	1.5	42	1,225	0	69	0	0	0	0	2	7	0	7	0	4	
4 Aug	2.5	44	1,269	0	69	0	0	0	0	1	8	0	8	0	4	
5 Aug	2.3	23	1,292	3	72	0	0	0	0	0	8	0	8	0	4	
6 Aug	3.0	34	1,326	3	75	0	0	0	0	2	10	1	5	1	5	
7 Aug	7.5	45	1,371	1	76	0	0	0	0	0	10	1	6	0	6	
8 Aug	4.5	1	1,372	0	76	0	0	0	0	0	10	0	6	0	6	
9 Aug	23.5	2	1,374	0	76	0	0	0	0	0	10	0	6	0	6	
10 Aug	22.0	20	1,394	0	76	0	0	0	0	0	10	0	6	0	6	
11 Aug	13.5	37	1,431	0	76	0	0	0	0	0	10	0	6	0	6	
12 Aug	24.0	2	1,433	0	76	0	0	0	0	0	10	0	6	0	6	
13 Aug	24.0	2	1,435	0	76	0	0	0	0	0	10	1	7	0	7	
Percent of Total:		93.9		5.0		0.0		0.7		0.5						
Total: 1,528 salmon				Hrs Operated: 427.2				CPUE: 3.6 fish/hr								

Table 8.—Summary of fish wheel catch and CPUE for the north bank fish wheel at RM 19, Kenai River, 1978–2009.

Year	Total Hours	Actual North Bank fish wheel catch (salmon only)								CPUE by species				Total CPUE	
		Sockeye	%	Pink	%	Coho	%	Chinook	%	Total Catch	Sockeye	Pink	Coho	Chinook	
1978	853.9	1,445	87.3	207	12.5	4	0.2	0	0.0	1,656	1.7	0.2	0.0	0.0	1.9
1979	301.0	151	84.8	10	5.6	13	7.3	4	2.2	178	0.5	0.0	0.0	0.0	0.6
1980	967.3	464	29.4	1,103	69.8	12	0.8	1	0.1	1,580	0.5	1.1	0.0	0.0	1.6
1981	1,210.8	496	95.0	21	4.0	3	0.6	2	0.4	522	0.4	0.0	0.0	0.0	0.4
1982	433.5	1,200	99.5	2	0.2	2	0.2	2	0.2	1,206	2.8	0.0	0.0	0.0	2.8
1983	448.0	1,678	99.8	0	0.0	3	0.2	0	0.0	1,681	3.7	0.0	0.0	0.0	3.8
1984	962.4	5,854	98.3	64	1.1	36	0.6	3	0.1	5,957	6.1	0.1	0.0	0.0	6.2
1985	394.8	3,294	98.2	37	1.1	17	0.5	7	0.2	3,355	8.3	0.1	0.0	0.0	8.5
1986	408.5	797	97.8	6	0.7	9	1.1	3	0.4	815	2.0	0.0	0.0	0.0	2.0
1987	493.1	4,795	98.1	18	0.4	59	1.2	17	0.3	4,889	9.7	0.0	0.1	0.0	9.9
1988	528.4	4,393	97.5	73	1.6	18	0.4	21	0.5	4,505	8.3	0.1	0.0	0.0	8.5
1989	357.0	6,341	98.2	69	1.1	28	0.4	16	0.2	6,454	17.8	0.2	0.1	0.0	18.1
1990	363.6	4,270	97.8	46	1.1	24	0.5	26	0.6	4,366	11.7	0.1	0.1	0.1	12.0
1991	393.0	6,732	98.6	49	0.7	25	0.4	19	0.3	6,825	17.1	0.1	0.1	0.0	17.4
1992	392.5	5,526	94.0	224	3.8	96	1.6	33	0.6	5,879	14.1	0.6	0.2	0.1	15.0
1993	515.2	4,631	99.2	16	0.3	10	0.2	10	0.2	4,667	9.0	0.0	0.0	0.0	9.1
1994	673.9	5,600	93.6	290	4.8	65	1.1	29	0.5	5,984	8.3	0.4	0.1	0.0	8.9
1995	799.4	3,022	98.5	14	0.5	10	0.3	22	0.7	3,068	3.8	0.0	0.0	0.0	3.8
1996	376.5	3,835	91.2	264	6.3	82	2.0	22	0.5	4,203	10.2	0.7	0.2	0.1	11.2
1997	553.8	8,886	96.6	21	0.2	266	2.9	30	0.3	9,203	16.0	0.0	0.5	0.1	16.6
1998	350.5	7,755	96.2	173	2.1	99	1.2	34	0.4	8,061	22.1	0.5	0.3	0.1	23.0
1999	400.8	4,600	95.9	108	2.3	56	1.2	33	0.7	4,797	11.5	0.3	0.1	0.1	12.0
2000	499.0	3,020	88.5	205	6.0	146	4.3	40	1.2	3,411	6.1	0.4	0.3	0.1	6.8
2001	446.7	3,309	96.8	36	1.1	30	0.9	45	1.3	3,420	7.4	0.1	0.1	0.1	7.7
2002	610.5	4,073	88.4	461	10.0	54	1.2	18	0.4	4,606	6.7	0.8	0.1	0.0	7.5
2003	317.1	2,749	98.0	20	0.7	12	0.4	25	0.9	2,806	8.7	0.1	0.0	0.1	8.8
2004	461.7	3,299	75.0	843	19.2	225	5.1	31	0.7	4,398	7.1	1.8	0.5	0.1	9.5
2005	184.9	3,140	97.8	27	0.8	28	0.9	16	0.5	3,211	17.0	0.1	0.2	0.1	17.4
2006	635.0	12,285	86.0	1,413	9.9	485	3.4	101	0.7	14,284	19.3	2.2	0.8	0.2	22.5
2007	933.5	6,243	98.1	16	0.3	76	1.2	27	0.4	6,362	6.7	0.0	0.1	0.0	6.8
2008	862.4	5,250	89.9	489	8.4	80	1.4	18	0.3	5,837	6.1	0.6	0.1	0.0	6.8
2009	427.2	1,435	93.9	76	5.0	10	0.7	7	0.5	1,528	3.4	0.2	0.0	0.0	3.6

-continued-

Table 8.—Page 2 of 2.

Year	Total Hours	Average catch by species per even or odd year								CPUE by species				Total CPUE	
		Sockeye	%	Pink	%	Coho	%	Chinook	%	Total Catch	Sockeye	Pink	Coho	Chinook	
Odd	516.6	4,004	96.9	31	1.3	42	1.2	18	0.6	4,096	7.8	0.1	0.1	0.0	7.9
Even	586.2	4,317	88.2	366	9.8	90	1.6	24	0.4	4,797	7.4	0.6	0.2	0.0	8.2
Average (%): (1978–2008)		92.4		5.7		1.4		0.5			7.5	0.2	0.4	0.0	0.1
Minimum (%): (1978–2008)		29.4		0.0		0.2		0.0			0.4	0.0	0.0	0.0	0.4
Maximum (%): (1978–2008)		99.8		69.8		7.3		2.2			22.1	2.2	0.8	0.2	23.0
Std Dev (%): (1978–2008)		13.0		12.7		1.6		0.4			5.9	0.5	0.2	0.0	6.1

Note: Fish wheel also deployed some years along the south bank.

Table 9.—Age composition of Kenai River sockeye salmon sampled from the Kenai River fish wheel, 1970–2009.

Year	Percentage Composition by Age Class								Sample Size
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	Other	
1970	0.0	10.0	17.0	0.0	26.0	25.0	15.0	6.0	225
1971	0.0	8.0	39.0	1.0	3.0	38.0	11.0	0.0	168
1972	0.0	21.0	34.0	0.0	0.0	23.0	20.0	0.0	403
1973	0.0	5.0	68.0	1.0	1.0	8.0	16.0	0.0	632
1974	2.0	18.0	46.0	0.0	3.0	18.0	12.0	0.0	295
1975	2.0	10.0	36.0	2.0	4.0	31.0	14.0	1.0	162
1976	1.0	46.0	20.0	0.0	2.0	22.0	8.0	1.0	948
1977	0.0	6.0	76.0	1.0	0.0	7.0	10.0	0.0	1,265
1978	0.0	2.5	86.7	0.0	0.0	4.9	5.4	0.0	811
1979	0.2	19.6	63.0	0.0	0.0	10.6	6.6	0.0	601
1980	6.1	35.4	36.7	0.0	0.9	14.4	6.5	0.0	557
1981	0.0	19.7	66.4	0.0	0.5	7.9	5.3	0.2	624
1982	0.1	5.8	87.5	0.0	0.0	2.9	3.7	0.0	1,787
1983	0.3	8.4	79.0	0.3	0.5	2.2	8.9	0.4	1,765
1984	0.0	23.1	37.8	3.6	0.5	13.2	19.5	2.3	2,067
1985	0.1	15.9	56.4	0.3	0.1	14.7	11.4	1.1	2,201
1986	0.0	31.8	39.5	0.7	0.3	8.2	18.0	1.5	789
1987	0.0	12.8	78.4	0.1	0.0	3.2	5.2	0.3	745
1988	0.3	11.6	74.2	0.4	0.2	3.1	10.2	0.0	1,420
1989	0.2	5.6	26.7	0.9	0.8	7.6	57.4	0.8	1,587
1990	0.6	21.6	41.4	0.6	0.3	13.7	21.1	0.7	1,513
1991	0.1	48.2	31.6	0.2	0.4	5.7	11.4	2.4	2,502
1992	0.0	2.7	79.9	0.2	0.3	5.9	11.0	0.0	1,338
1993	0.3	12.2	30.5	2.6	6.3	6.4	41.2	0.5	2,088
1994	0.3	6.6	61.1	0.8	0.8	17.8	12.1	0.5	1,341
1995	0.3	31.9	26.4	0.4	2.4	6.6	31.3	0.7	712
1996	0.0	10.8	75.4	0.3	0.7	6.1	5.4	1.3	684
1997	0.1	7.6	75.2	0.4	0.4	2.8	13.0	0.5	963
1998	0.3	27.1	40.7	1.3	6.6	9.6	13.9	0.5	700
1999	0.0	15.1	55.4	0.4	1.2	16.8	9.6	1.5	733
2000	0.0	15.3	55.1	1.0	2.6	9.4	14.5	2.1	560
2001	0.3	10.8	68.9	0.8	1.5	8.3	9.2	0.2	601
2002	0.0	23.0	58.4	0.7	0.7	10.6	6.1	0.5	2,441
2003	0.0	14.4	57.9	0.4	0.1	8.0	18.7	0.5	1,555
2004	0.0	10.1	69.1	0.2	0.2	8.2	11.1	1.1	1,275
2005	0.0	2.8	81.3	0.3	0.2	2.8	11.8	0.8	1,893
2006	0.0	9.9	38.7	2.4	0.4	3.7	44.0	0.9	1,315
2007	0.0	5.9	78.8	1.5	0.7	4.4	7.8	0.9	759
2008	0.0	15.2	60.9	4.6	0.7	7.2	10.9	0.5	567
2009	0.3	6.1	72.6	0.9	0.1	9.8	9.7	0.4	701
Ave. (1970–2008)	0.4	15.6	55.3	0.8	1.8	10.7	14.6	0.8	1,092

Table 10.—Average length composition of the major age classes of sockeye salmon sampled from the Kenai River fish wheel, 1980–2009.

Year	Age Class	Male		Female		Both		Ratio Male-Female	Age Class	Male		Female		Both		Ratio Male-Female
		Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size			Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size	
1980	1.2	482	168	494	100	486	268	1.7:1	1.3	580	180	561	192	570	372	0.9:1
1981		493	85	513	73	501	158	1.2:1		590	290	569	430	575	720	0.7:1
1982		483	70	505	32	490	102	2.2:1		596	723	572	841	583	1,564	0.9:1
1983		524	25	520	30	522	55	0.8:1		598	215	577	269	586	484	0.8:1
1984		474	280	473	196	474	476	1.4:1		582	385	559	395	571	780	1.0:1
1985		492	184	490	186	491	370	1.0:1		575	496	552	824	560	1,320	0.6:1
1986		488	155	492	96	489	251	1.6:1		584	112	564	200	571	312	0.6:1
1987		513	39	502	56	507	95	0.7:1		604	183	586	401	591	584	0.5:1
1988		521	79	511	84	516	163	0.9:1		598	428	572	624	583	1,052	0.7:1
1989		464	51	463	40	463	91	1.3:1		592	213	565	218	578	431	1.0:1
1990		474	168	478	127	476	295	1.3:1		586	358	559	318	574	676	1.1:1
1991		488	613	497	577	492	1,190	1.1:1		561	357	539	441	549	798	0.8:1
1992		480	13	462	25	468	38	0.5:1		573	370	549	714	557	1,084	0.5:1
1993		474	123	481	132	477	255	0.9:1		583	247	556	390	566	637	0.6:1
1994		452	46	462	42	457	88	1.1:1		579	367	552	452	564	819	0.8:1
1995		492	116	487	111	489	227	1.0:1		584	81	564	107	572	188	0.8:1
1996		507	47	519	27	511	74	1.7:1		607	243	589	273	597	516	0.9:1
1997		480	34	489	39	485	73	0.9:1		593	372	571	352	582	724	1.1:1
1998		483	95	494	95	488	190	1.0:1		577	146	547	139	562	285	1.1:1
1999		490	72	488	39	490	111	1.8:1		600	202	576	204	588	406	1.0:1
2000		513	47	513	43	513	90	1.1:1		605	159	584	165	594	324	1.0:1
2001		522	35	507	30	515	65	1.2:1		596	196	577	218	586	414	0.9:1
2002		503	306	502	256	503	562	1.2:1		606	665	580	760	592	1,425	0.9:1
2003		483	116	466	117	474	233	1.0:1		593	387	574	504	582	891	0.8:1
2004		497	64	482	65	489	129	1.0:1		585	396	569	485	576	881	0.8:1
2005		483	27	495	30	490	57	0.9:1		588	649	564	883	574	1,532	0.7:1
2006		498	72	497	58	497	130	1.2:1		572	239	553	270	562	509	0.9:1
2007		512	21	499	24	505	45	0.9:1		594	313	567	285	581	598	1.1:1
2008		472	45	465	41	468	86	1.1:1		595	160	576	185	585	345	0.9:1
2009		482	24	492	19	486	43	1.3:1		594	206	578	303	584	509	0.7:1
Average (1980–2008)		482	110	484	96	483	206	1.2:1		579	315	556	398	566	713	0.8:1

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Table 10.—Page 2 of 2.

Table 11.—Climatological data for the Kasilof, Kenai, Crescent and Yentna rivers, 1979–2009.

Year	Kasilof River				Kenai River			
	Water Level Gain (m)	Turbidity (cm)	Air °C	Water °C	Water Level Gain (m)	Turbidity (cm)	Air °C	Water °C
1979	ND	ND	ND	ND	ND	ND	ND	ND
1980	ND	ND	ND	ND	ND	ND	ND	ND
1981	ND	ND	ND	ND	ND	ND	ND	ND
1982	1.0	ND	12.0	10.2	0.5	ND	14.2	9.3
1983	ND	ND	ND	ND	0.4	ND	ND	12.6
1984	0.6	ND	ND	14.4	0.5	ND	ND	12.5
1985	0.8	ND	ND	13.0	ND	ND	ND	ND
1986	1.3	ND	ND	11.0	ND	ND	ND	ND
1987	ND	ND	ND	ND	0.4	ND	14.7	9.3
1988	ND	ND	ND	ND	0.3	ND	15.8	11.8
1989	1.3	ND	16.6	13.3	0.8	73.9	15.1	6.8
1990	0.8	ND	17.2	15.0	0.5	77.7	15.0	12.6
1991	0.6	ND	15.7	13.3	0.2	89.9	13.4	12.8
1992	0.8	ND	18.0	13.0	0.5	88.9	15.0	12.0
1993	0.9	ND	19.0	6.2	0.7	99.8	16.6	13.0
1994	1.5	ND	17.1	13.2	0.4	87.6	14.3	11.4
1995	0.9	ND	16.0	12.5	0.4	101.6	14.1	11.1
1996	1.0	ND	16.0	13.0	0.8	52.3	13.6	12.1
1997	1.2	ND	19.0	16.0	0.3	66.5	14.0	14.0
1998	0.9	ND	13.6	16.5	0.5	69.1	13.4	12.0
1999	1.0	ND	13.4	14.6	0.4	74.2	13.9	12.5
2000	1.0	ND	11.3	14.6	0.4	77.7	13.3	11.6
2001	0.7	ND	18.6	15.5	0.4	80.0	13.8	12.4
2002	1.1	ND	17.8	9.1	0.3	99.3	15.0	12.6
2003	1.1	ND	17.1	10.4	0.5	58.4	15.1	12.3
2004	1.1	ND	19.9	13.5	0.5	83.3	16.1	14.3
2005	0.9	ND	19.6	14.8	0.2	109.2	14.1	14.2
2006	0.9	ND	16.7	12.5	0.4	107.7	13.0	11.7
2007	1.0	42.2	17.9	14.9	0.4	85.3	13.6	12.5
2008	0.9	ND	16.0	11.3	0.4	92.7	12.5	10.6
2009	1.2	ND	17.0	12.3	1.1	74.1	13.8	12.5
1979–2008								
Ave	1.0	ND	16.6	13.0	0.4	83.8	14.3	11.9
Min	0.6	ND	11.3	6.2	0.2	52.3	12.5	6.8
Max	1.5	ND	19.9	16.5	0.8	109.2	16.6	14.3

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Table 11.–Page 2 of 2.

Year	Kasilof River				Kenai River			
	Water Level Gain (m)	Turbidity (cm)	Air °C	Water °C	Water Level Gain (m)	Turbidity (cm)	Air °C	Water °C
1979	0.6	ND	ND	9.1	ND	ND	ND	ND
1980	ND	ND	ND	ND	ND	ND	ND	ND
1981	0.4	ND	10.6	19.2	ND	ND	ND	ND
1982	0.2	ND	9.6	18.1	ND	ND	ND	ND
1983	0.4	ND	14.0	7.4	ND	ND	ND	ND
1984	0.2	ND	18.1	9.6	ND	ND	ND	ND
1985	0.8	ND	14.0	7.2	0.8	ND	13.9	ND
1986	1.4	ND	12.4	8.9	1.4	ND	12.5	8.9
1987	ND	ND	ND	ND	ND	ND	ND	ND
1988	ND	ND	ND	ND	ND	ND	ND	ND
1989	0.5	26.2	15.0	8.5	1.5	ND	12.6	8.7
1990	0.4	23.1	15.3	10.6	ND	ND	ND	ND
1991	0.2	35.9	12.0	12.6	1.2	ND	8.3	8.6
1992	0.5	45.0	12.4	7.8	1.2	ND	9.6	8.1
1993	0.4	42.9	12.3	9.2	1.2	ND	13.2	9.8
1994	0.7	45.2	11.8	7.4	0.8	ND	11.7	9.1
1995	0.6	37.3	11.6	8.9	1.4	ND	11.9	9.1
1996	0.3	31.5	12.5	10.3	1.2	ND	10.4	9.2
1997	0.4	15.0	15.0	11.6	1.0	ND	17.2	9.7
1998	0.7	40.1	10.8	7.3	1.1	ND	15.8	8.9
1999	0.5	36.8	15.0	9.4	1.1	ND	14.1	9.4
2000	0.4	47.0	16.7	9.5	1.5	ND	13.2	9.5
2001	0.4	30.2	14.9	8.9	1.4	ND	13.4	9.3
2002	0.3	37.6	14.3	8.2	1.4	ND	13.9	10.4
2003	0.6	40.1	14.9	9.3	1.6	ND	17.2	9.9
2004	0.6	20.3	14.2	9.9	1.0	ND	13.1	9.9
2005	0.5	22.9	14.0	9.9	1.3	ND	12.1	10.3
2006	0.5	33.0	12.5	9.1	2.1	ND	7.3	9.6
2007	0.4	42.2	12.0	9.2	1.4	ND	7.4	10.0
2008	0.3	58.4	10.9	8.2	1.7	ND	6.2	8.8
2009 ^a	ND	ND	ND	ND	1.6	ND	6.2	9.4
1979–2008								
Ave	0.5	35.5	13.3	9.8	1.3	ND	12.1	9.4
Min	0.2	15.0	9.6	7.2	0.8	ND	6.2	8.1
Max	1.4	58.4	18.1	19.2	2.1	ND	17.2	10.4

^a Crescent River Station did not operate in 2009 because of volcanic activity.

Table 12.—Sockeye, pink, and chum salmon passage in the Kasilof River, 2009.

Date	Sockeye		Pink		Chum		Date	Sockeye		Pink		Chum	
	Daily	Cum	Daily	Cum	Daily	Cum		Daily	Cum	Daily	Cum	Daily	Cum
15 Jun	2,304	2,304	0	0	0	0	15 Jul	20,909	159,019	0	2,778	0	0
16 Jun	2,202	4,506	0	0	0	0	16 Jul	7,744	166,763	498	3,276	0	0
17 Jun	964	5,470	0	0	0	0	17 Jul	6,662	173,425	238	3,514	238	238
18 Jun	939	6,409	0	0	0	0	18 Jul	5,202	178,627	200	3,714	0	238
19 Jun	1,971	8,380	0	0	0	0	19 Jul	10,417	189,044	0	3,714	0	238
20 Jun	6,126	14,506	0	0	0	0	20 Jul	6,129	195,173	332	4,046	0	238
21 Jun	3,435	17,941	0	0	0	0	21 Jul	3,008	198,181	0	4,046	0	238
22 Jun	1,511	19,452	0	0	0	0	22 Jul	1,758	199,939	406	4,452	0	238
23 Jun	2,195	21,647	0	0	0	0	23 Jul	2,052	201,991	100	4,552	0	238
24 Jun	3,349	24,996	0	0	0	0	24 Jul	2,110	204,101	0	4,552	0	238
25 Jun	5,961	30,957	0	0	0	0	25 Jul	4,939	209,040	0	4,552	0	238
26 Jun	3,398	34,355	0	0	0	0	26 Jul	10,729	219,769	0	4,552	0	238
27 Jun	6,414	40,769	0	0	0	0	27 Jul	10,790	230,559	211	4,763	0	238
28 Jun	1,541	42,310	0	0	0	0	28 Jul	3,708	234,267	0	4,763	0	238
29 Jun	3,257	45,567	0	0	0	0	29 Jul	5,813	240,080	0	4,763	0	238
30 Jun	3,728	49,295	0	0	0	0	30 Jul	6,686	246,766	0	4,763	0	238
1 Jul	9,958	59,253	0	0	0	0	31 Jul	4,324	251,090	0	4,763	0	238
2 Jul	4,257	63,510	0	0	0	0	1 Aug	5,105	256,195	0	4,763	0	238
3 Jul	4,644	68,154	0	0	0	0	2 Aug	4,703	260,898	0	4,763	0	238
4 Jul	9,638	77,792	0	0	0	0	3 Aug	5,003	265,901	0	4,763	0	238
5 Jul	2,693	80,485	0	0	0	0	4 Aug	5,265	271,166	0	4,763	0	238
6 Jul	8,006	88,491	0	0	0	0	5 Aug	5,143	276,309	0	4,763	0	238
7 Jul	4,582	93,073	0	0	0	0	6 Aug	4,034	280,343	0	4,763	0	238
8 Jul	1,902	94,975	0	0	0	0	7 Aug	2,953	283,296	0	4,763	0	238
9 Jul	5,782	100,757	399	399	0	0	8 Aug	3,313	286,609	0	4,763	0	238
10 Jul	4,116	104,873	206	605	0	0	9 Aug	3,106	289,715	0	4,763	0	238
11 Jul	12,860	117,733	1,805	2,410	0	0	10 Aug	2,113	291,828	0	4,763	0	238
12 Jul	4,378	122,111	0	2,410	0	0	11 Aug	1,333	293,161	0	4,763	0	238
13 Jul	4,883	126,994	368	2,778	0	0	12 Aug	2,064	295,225	0	4,763	0	238
14 Jul	11,116	138,110	0	2,778	0	0	13 Aug	1,900	297,125	0	4,763	0	238

Note: There were no coho or Chinook salmon in the fish wheel catch during the time sonar counts were apportioned.

Table 13.—Cumulative proportion by date of salmon passage recorded in the Kaslof River, 1993–2009.

Date	Cumulative Proportion																
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
15 Jun	0.052	0.007	0.001	0.003	0.007	0.001	0.002	0.001	0.006	0.027	0.004	0.007	0.022	0.009	0.012	0.001	0.008
16 Jun	0.064	0.010	0.002	0.007	0.013	0.003	0.004	0.002	0.020	0.039	0.007	0.010	0.043	0.013	0.025	0.002	0.015
17 Jun	0.074	0.014	0.004	0.016	0.026	0.006	0.007	0.004	0.043	0.051	0.009	0.013	0.073	0.018	0.033	0.004	0.018
18 Jun	0.090	0.017	0.006	0.023	0.039	0.016	0.009	0.010	0.064	0.067	0.011	0.017	0.115	0.023	0.039	0.005	0.022
19 Jun	0.103	0.020	0.010	0.033	0.061	0.029	0.012	0.015	0.085	0.095	0.017	0.022	0.164	0.030	0.045	0.008	0.028
20 Jun	0.118	0.025	0.016	0.047	0.098	0.036	0.016	0.022	0.097	0.119	0.032	0.034	0.211	0.039	0.051	0.018	0.049
21 Jun	0.132	0.029	0.024	0.055	0.125	0.048	0.025	0.027	0.110	0.138	0.053	0.053	0.238	0.054	0.057	0.031	0.060
22 Jun	0.143	0.034	0.032	0.079	0.141	0.065	0.038	0.040	0.124	0.157	0.065	0.092	0.246	0.065	0.067	0.049	0.065
23 Jun	0.154	0.039	0.040	0.111	0.157	0.082	0.055	0.055	0.146	0.174	0.092	0.138	0.251	0.076	0.079	0.074	0.073
24 Jun	0.179	0.047	0.047	0.145	0.184	0.094	0.072	0.075	0.174	0.185	0.113	0.187	0.261	0.087	0.086	0.090	0.084
25 Jun	0.217	0.058	0.059	0.162	0.227	0.107	0.099	0.096	0.210	0.194	0.128	0.222	0.283	0.104	0.094	0.111	0.104
26 Jun	0.257	0.071	0.071	0.181	0.276	0.124	0.120	0.122	0.229	0.212	0.152	0.224	0.303	0.124	0.096	0.161	0.116
27 Jun	0.293	0.094	0.088	0.227	0.321	0.152	0.147	0.147	0.258	0.230	0.155	0.226	0.316	0.144	0.103	0.187	0.137
28 Jun	0.317	0.129	0.120	0.295	0.337	0.181	0.181	0.169	0.294	0.233	0.156	0.232	0.329	0.164	0.119	0.213	0.142
29 Jun	0.330	0.172	0.166	0.318	0.360	0.212	0.216	0.202	0.307	0.235	0.165	0.239	0.355	0.184	0.122	0.221	0.153
30 Jun	0.357	0.220	0.196	0.346	0.392	0.224	0.244	0.233	0.330	0.239	0.188	0.247	0.361	0.191	0.123	0.236	0.166
01 Jul	0.386	0.250	0.216	0.381	0.412	0.252	0.277	0.264	0.344	0.266	0.197	0.250	0.385	0.197	0.128	0.243	0.199
02 Jul	0.419	0.256	0.229	0.386	0.454	0.276	0.291	0.301	0.375	0.280	0.214	0.253	0.421	0.211	0.139	0.253	0.214
03 Jul	0.429	0.282	0.241	0.389	0.468	0.290	0.307	0.328	0.389	0.313	0.248	0.257	0.438	0.225	0.143	0.263	0.229
04 Jul	0.441	0.322	0.248	0.399	0.513	0.297	0.315	0.337	0.409	0.346	0.264	0.265	0.459	0.244	0.152	0.267	0.262
05 Jul	0.459	0.333	0.265	0.438	0.521	0.321	0.332	0.361	0.414	0.354	0.268	0.268	0.483	0.261	0.156	0.274	0.271
06 Jul	0.467	0.375	0.293	0.452	0.526	0.353	0.347	0.383	0.424	0.379	0.284	0.274	0.501	0.275	0.160	0.279	0.298
07 Jul	0.496	0.437	0.315	0.475	0.544	0.365	0.377	0.394	0.449	0.427	0.314	0.289	0.510	0.288	0.174	0.299	0.313
08 Jul	0.537	0.483	0.322	0.496	0.548	0.385	0.412	0.416	0.476	0.469	0.329	0.299	0.527	0.295	0.201	0.309	0.320
09 Jul	0.548	0.501	0.335	0.499	0.556	0.411	0.419	0.441	0.482	0.487	0.351	0.302	0.537	0.310	0.218	0.317	0.339
10 Jul	0.558	0.535	0.355	0.507	0.566	0.438	0.427	0.472	0.493	0.514	0.379	0.305	0.549	0.330	0.225	0.332	0.353
11 Jul	0.571	0.545	0.359	0.524	0.582	0.446	0.439	0.481	0.498	0.525	0.410	0.307	0.582	0.337	0.243	0.339	0.396
12 Jul	0.590	0.552	0.365	0.528	0.598	0.452	0.445	0.502	0.505	0.533	0.463	0.314	0.613	0.342	0.248	0.354	0.411
13 Jul	0.680	0.565	0.373	0.538	0.617	0.465	0.453	0.534	0.513	0.546	0.480	0.377	0.640	0.348	0.253	0.362	0.427
14 Jul	0.707	0.584	0.387	0.650	0.624	0.474	0.467	0.594	0.530	0.553	0.504	0.538	0.654	0.358	0.267	0.392	0.465
15 Jul	0.748	0.623	0.395	0.710	0.630	0.496	0.473	0.664	0.562	0.570	0.523	0.603	0.665	0.400	0.277	0.455	0.535
16 Jul	0.792	0.636	0.487	0.721	0.643	0.522	0.481	0.673	0.596	0.582	0.603	0.634	0.684	0.437	0.289	0.518	0.561
17 Jul	0.804	0.679	0.618	0.728	0.673	0.573	0.501	0.691	0.640	0.597	0.675	0.653	0.696	0.447	0.298	0.559	0.584
18 Jul	0.816	0.711	0.641	0.737	0.682	0.603	0.516	0.702	0.688	0.621	0.706	0.666	0.716	0.456	0.369	0.585	0.601
19 Jul	0.828	0.732	0.667	0.758	0.689	0.642	0.534	0.730	0.706	0.642	0.722	0.676	0.731	0.469	0.425	0.648	0.636

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Table 13.–Page 2 of 2.

Date	Cumulative Proportion																	
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
20 Jul	0.839	0.750	0.688	0.777	0.696	0.671	0.563	0.763	0.717	0.678	0.734	0.684	0.744	0.476	0.449	0.666	0.657	
21 Jul	0.849	0.763	0.704	0.790	0.700	0.687	0.619	0.777	0.729	0.687	0.757	0.711	0.755	0.484	0.520	0.689	0.667	
22 Jul	0.857	0.771	0.753	0.806	0.707	0.713	0.679	0.807	0.733	0.708	0.787	0.724	0.766	0.491	0.585	0.717	0.673	
23 Jul	0.877	0.778	0.807	0.823	0.727	0.740	0.721	0.843	0.746	0.723	0.820	0.741	0.785	0.498	0.623	0.735	0.680	
24 Jul	0.892	0.789	0.868	0.850	0.741	0.773	0.757	0.876	0.800	0.752	0.834	0.755	0.802	0.504	0.663	0.753	0.687	
25 Jul	0.909	0.799	0.883	0.875	0.750	0.799	0.792	0.895	0.901	0.791	0.852	0.769	0.817	0.518	0.728	0.783	0.704	
26 Jul	0.921	0.806	0.898	0.883	0.756	0.820	0.829	0.912	0.911	0.812	0.864	0.780	0.830	0.527	0.784	0.831	0.740	
27 Jul	0.930	0.813	0.919	0.890	0.763	0.839	0.865	0.931	0.927	0.823	0.882	0.788	0.837	0.537	0.819	0.871	0.776	
28 Jul	0.946	0.826	0.927	0.896	0.773	0.870	0.881	0.947	0.936	0.835	0.901	0.799	0.846	0.590	0.833	0.894	0.788	
29 Jul	0.958	0.846	0.934	0.900	0.781	0.893	0.900	0.965	0.950	0.852	0.917	0.807	0.861	0.676	0.848	0.906	0.808	
30 Jul	0.969	0.868	0.939	0.904	0.793	0.913	0.913	0.974	0.967	0.862	0.929	0.815	0.880	0.705	0.863	0.915	0.831	
31 Jul	0.974	0.892	0.945	0.907	0.802	0.938	0.925	0.983	0.980	0.873	0.939	0.822	0.889	0.739	0.881	0.927	0.845	
01 Aug	0.979	0.928	0.950	0.923	0.810	0.960	0.935	0.990	0.988	0.887	0.947	0.827	0.896	0.771	0.894	0.938	0.862	
02 Aug	0.987	0.943	0.956	0.938	0.820	0.968	0.948	1.000	0.993	0.908	0.956	0.833	0.902	0.806	0.903	0.947	0.878	
03 Aug	0.992	0.952	0.969	0.952	0.829	0.974	0.961		1.000	0.925	0.963	0.843	0.911	0.829	0.910	0.957	0.895	
04 Aug	0.996	0.959	0.984	0.969	0.836	0.980	0.972			0.940	0.967	0.864	0.915	0.855	0.922	0.967	0.913	
05 Aug	1.000	0.966	0.988	0.979	0.850	0.988	0.979			0.949	0.973	0.877	0.923	0.870	0.931	0.974	0.930	
06 Aug		0.972	0.993	0.984	0.872	0.992	0.986			0.958	0.979	0.887	0.933	0.880	0.938	0.980	0.944	
07 Aug		0.977	1.000	0.992	0.896	0.997	0.993			0.969	0.985	0.897	0.936	0.886	0.949	0.984	0.953	
08 Aug		0.981		1.000	0.925	1.000	1.000			0.978	0.990	0.906	0.940	0.892	0.962	0.988	0.965	
09 Aug		0.987			0.945					0.987	0.994	0.923	0.943	0.901	0.974	0.994	0.975	
10 Aug		0.994			0.962					0.994	1.000	0.935	0.947	0.909	0.980	1.000	0.982	
11 Aug		1.000			0.984					1.000		0.946	0.954	0.923	0.989		0.987	
12 Aug					1.000							0.957	0.968	0.940	0.996		0.994	
13 Aug												0.970	0.980	0.956	1.000			
14 Aug												0.982	0.991	0.966				
15 Aug												0.992	1.000	0.978				
16 Aug												1.000		0.987				
17 Aug														0.994				
18 Aug														1.000				
Midpoint No. days for 80% ^a	8 Jul	9 Jul	17 Jul	10 Jul	4 Jul	16 Jul	17 Jul	12 Jul	12 Jul	10 Jul	14 Jul	14 Jul	6 Jul	24 Jul	21 Jul	16 Jul	15 Jul	
	37	35	30	30	49	36	34	31	35	44	34	46	46	46	37	35	41	
Average midpoint (1979–2008): 14 July																		

^a Inclusive dates: date proportion of passage reached 10% through date proportion reached 90%.

Table 14.—Daily fish wheel catch by species for the Kasilof River, 2009.

Date	Hours Fished	Sockeye		Pink		Chum		Coho		Chinook	
		Dail	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
15 Jun	0.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16 Jun	0.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
17 Jun	22.2	4	4	0	0	0	0	0	0	0	0
18 Jun	25.5	15	19	0	0	0	0	0	0	0	0
19 Jun	22.7	3	22	0	0	0	0	0	0	0	0
20 Jun	22.8	10	32	0	0	0	0	0	0	0	0
21 Jun	28.0	55	87	0	0	0	0	0	0	0	0
22 Jun	25.7	5	92	0	0	0	0	0	0	0	0
23 Jun	16.6	10	102	0	0	0	0	0	0	1	1
24 Jun	21.8	17	119	0	0	0	0	0	0	0	1
25 Jun	9.5	35	154	0	0	0	0	0	0	0	1
26 Jun	7.3	10	164	0	0	0	0	0	0	0	1
27 Jun	12.2	35	199	0	0	0	0	0	0	0	1
28 Jun	8.0	65	264	0	0	0	0	0	0	1	2
29 Jun	25.7	19	283	0	0	0	0	0	0	1	3
30 Jun	15.0	24	307	0	0	0	0	0	0	0	3
1 Jul	3.5	34	341	0	0	0	0	0	0	0	3
2 Jul	5.5	29	370	0	0	0	0	0	0	0	3
3 Jul	20.3	66	436	0	0	0	0	0	0	0	3
4 Jul	4.5	65	501	0	0	0	0	0	0	0	3
5 Jul	3.0	4	505	0	0	0	0	0	0	0	3
6 Jul	11.8	41	546	1	1	0	0	0	0	0	3
7 Jul	8.5	13	559	0	1	0	0	0	0	0	3
8 Jul	9.4	69	628	2	3	0	0	0	0	0	3
9 Jul	7.6	29	657	2	5	0	0	0	0	0	3
10 Jul	1.8	20	677	1	6	0	0	0	0	0	3
11 Jul	8.7	57	734	8	14	0	0	0	0	0	3
12 Jul	2.0	45	779	0	14	0	0	0	0	0	3
13 Jul	5.6	53	832	4	18	0	0	0	0	0	3
14 Jul	4.5	42	874	0	18	0	0	0	0	0	3
15 Jul	1.7	67	941	0	18	0	0	0	0	0	3
16 Jul	1.5	109	1,050	7	25	0	0	0	0	0	3
17 Jul	6.5	28	1,078	1	26	1	1	0	0	0	3
18 Jul	6.0	26	1,104	1	27	0	1	0	0	0	3
19 Jul	9.6	15	1,119	0	27	0	1	0	0	0	3
20 Jul	3.5	37	1,156	2	29	0	1	0	0	0	3
21 Jul	6.8	46	1,202	0	29	0	1	0	0	0	3
22 Jul	5.3	26	1,228	6	35	0	1	0	0	0	3
23 Jul	4.5	62	1,290	3	38	0	1	0	0	0	3
24 Jul	2.7	10	1,300	0	38	0	1	0	0	0	3
25 Jul	20.5	8	1,308	0	38	0	1	0	0	0	3
26 Jul	11.7	19	1,327	0	38	0	1	0	0	0	3
27 Jul	17.4	51	1,378	1	39	0	1	0	0	0	3
28 Jul	8.8	0	1,378	0	39	0	1	0	0	0	3
29 Jul	19.8	6	1,384	0	39	0	1	0	0	0	3
30 Jul	28.2	6	1,390	3	42	0	1	0	0	1	4
31 Jul-	0	ND	1,390	ND	42	ND	1	ND	0	ND	4
12 Aug											
% of Total:		96.7		2.9		0.1		0.0		0.3	
Total catch:	1,437 salmon		Hrs Operated:		1,951.2			CPUE (fish/hr):		0.7	

Note: Fish wheel not operated 15 and 16 June because of low water; 31 July, 12 August because of high water.

Table 15.—Summary of fish wheel catches and CPUE for the north bank of the Kasilof River, 1983–2009.

Year	Total Hours	Actual North Bank fish wheel catch (salmon only)								CPUE by species				Total CPUE	
		Sockeye	%	Pink	%	Coho	%	Chinook	%	Total Catch	Sockeye	Pink	Coho	Chinook	
1983	582.5	2,094	96.8	26	1.2	2	0.1	41	1.9	2,163	3.6	0.0	0.0	0.1	3.7
1984	809.5	3,907	97.7	44	1.1	8	0.2	41	1.0	4,000	4.8	0.1	0.0	0.1	4.9
1985	747.0	4,996	98.3	49	1.0	4	0.1	32	0.6	5,081	6.7	0.1	0.0	0.0	6.8
1986	613.0	7,186	97.4	77	1.0	6	0.1	108	1.5	7,377	11.7	0.1	0.0	0.2	12.0
1987	768.4	3,910	96.2	20	0.5	0	0.0	136	3.3	4,066	5.1	0.0	0.0	0.2	5.3
1988	720.0	4,662	96.7	37	0.8	3	0.1	119	2.5	4,821	6.5	0.1	0.0	0.2	6.7
1989	959.1	4,017	94.0	154	3.6	5	0.1	99	2.3	4,275	4.2	0.2	0.0	0.1	4.5
1990	1,073.8	1,750	93.4	26	1.4	0	0.0	98	5.2	1,874	1.6	0.0	0.0	0.1	1.7
1991	557.7	1,889	95.9	65	3.3	1	0.1	14	0.7	1,969	3.4	0.1	0.0	0.0	3.5
1992	778.8	2,380	95.0	40	1.6	2	0.1	82	3.3	2,504	3.1	0.1	0.0	0.1	3.2
1993	840.0	2,100	93.9	52	2.3	0	0.0	85	3.8	2,237	2.5	0.1	0.0	0.1	2.7
1994	609.3	3,514	97.3	37	1.0	3	0.1	59	1.6	3,613	5.8	0.1	0.0	0.1	5.9
1995	678.2	2,023	96.4	28	1.3	1	0.0	46	2.2	2,098	3.0	0.0	0.0	0.1	3.1
1996	505.8	3,009	98.9	5	0.2	2	0.1	28	0.9	3,044	5.9	0.0	0.0	0.1	6.0
1997	505.0	2,076	97.0	16	0.7	3	0.1	46	2.1	2,141	4.1	0.0	0.0	0.1	4.2
1998	462.9	1,937	96.6	18	0.9	4	0.2	47	2.3	2,006	4.2	0.0	0.0	0.1	4.3
1999	503.0	1,952	92.1	108	5.1	2	0.1	58	2.7	2,120	3.9	0.2	0.0	0.1	4.2
2000	670.5	1,792	94.2	37	1.9	16	0.8	57	3.0	1,902	2.7	0.1	0.0	0.1	2.8
2001	391.4	1,765	96.4	23	1.3	1	0.1	42	2.3	1,831	4.5	0.1	0.0	0.1	4.7
2002	843.4	2,449	96.9	29	1.1	13	0.5	37	1.5	2,528	2.9	0.0	0.0	0.0	3.0
2003	822.2	1,704	98.3	15	0.9	0	0.0	14	0.8	1,733	2.1	0.0	0.0	0.0	2.1
2004	953.6	1,991	95.7	48	2.3	2	0.1	39	1.9	2,080	2.1	0.1	0.0	0.0	2.2
2005	785.1	1,812	95.5	66	3.5	0	0.0	19	1.0	1,897	2.3	0.1	0.0	0.0	2.4
2006	739.5	1,630	94.4	39	2.3	24	1.4	34	2.0	1,727	2.2	0.1	0.0	0.0	2.3
2007	877.3	1,580	97.8	15	0.9	4	0.2	17	1.1	1,616	1.8	0.0	0.0	0.0	1.8
2008	448.1	1,931	99.4	9	0.5	1	0.1	2	0.1	1,943	4.3	0.0	0.0	0.0	4.3
2009	514.2	1,390	96.8	42	2.9	0	0.0	4	0.3	1,436	2.7	0.1	0.0	0.0	2.8
Average (%): (1983–2008)		96.2		1.6		0.2		2.0			4.0	0.1	0.0	0.1	4.2
Minimum (%): (1983–2008)		92.1		0.2		0.0		0.1			1.6	0.0	0.0	0.0	1.7
Maximum (%): (1983–2008)		99.4		5.1		1.4		5.2			11.7	0.2	0.0	0.2	12.0
Std Dev (%): (1983–2008)		1.8		1.2		0.3		1.1			2.1	0.0	0.0	0.0	2.2

Note: Trout and Dolly Varden are a small part (usually <1%) of the catch; fish wheels also deployed along the south bank 1978–1992.

Table 16.—Age composition of sockeye salmon sampled from the Kasilof River fish wheel catch, 1969–2009.

Year	Percentage Composition by Age Class								Sample Size
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	Other	
1969	0.0	14.0	39.0	1.0	0.0	30.0	16.0	0.0	399
1970	0.0	2.0	37.0	2.0	0.0	16.0	11.0	2.0	297
1971	0.0	6.0	69.0	0.0	0.0	8.0	16.0	1.0	153
1972	0.0	42.0	36.0	1.0	0.0	3.0	18.0	0.0	668
1973	0.0	20.0	57.0	0.0	0.0	19.0	4.0	0.0	374
1974	0.0	35.0	59.0	0.0	0.0	4.0	2.0	0.0	254
1975	1.0	29.0	7.0	0.0	0.0	58.0	4.0	1.0	931
1976	0.2	35.9	24.1	0.0	0.0	28.2	11.4	0.2	755
1977	0.3	29.4	30.0	0.0	0.8	27.8	11.7	0.0	1,209
1978	0.0	41.3	40.1	0.0	0.0	10.4	8.2	0.0	967
1979	0.7	58.9	28.2	0.0	0.0	10.5	1.6	0.1	590
1980	2.1	67.0	23.1	0.1	0.0	5.0	2.7	0.0	899
1981	0.0	28.9	63.6	0.0	0.0	5.9	1.6	0.0	1,479
1982	0.8	30.6	54.4	0.0	0.2	9.3	4.7	0.0	1,518
1983	0.0	49.5	33.1	0.0	0.0	12.9	4.5	0.0	1,997
1984	0.0	50.5	24.8	0.0	0.2	17.9	6.6	0.0	2,269
1985	0.2	57.3	21.8	0.1	0.1	17.8	2.6	0.1	3,063
1986	0.0	40.9	42.0	0.3	0.1	11.9	4.6	0.2	1,660
1987	0.2	43.4	27.4	0.0	0.1	22.4	6.4	0.1	1,248
1988	0.1	33.7	36.4	0.2	0.1	17.5	12.0	0.1	2,282
1989	0.0	14.9	35.3	0.1	0.1	36.6	13.0	0.0	1,301
1990	0.4	32.9	20.7	0.3	0.0	33.2	12.4	0.3	762
1991	0.0	31.5	33.4	0.1	0.1	29.0	5.8	0.1	2,106
1992	0.0	21.1	27.5	0.0	0.2	35.3	16.0	0.0	1,717
1993	0.4	16.3	29.8	0.0	0.4	28.0	25.2	0.0	571
1994	0.0	26.4	28.4	0.0	0.0	28.2	17.0	0.0	723
1995	0.2	44.0	15.5	0.0	0.0	25.0	15.3	0.0	587
1996	0.0	24.8	48.3	0.0	0.0	21.4	5.6	0.0	721
1997	0.0	21.1	54.8	0.0	0.0	13.5	10.7	0.0	758
1998	0.1	39.7	28.1	0.4	0.6	22.2	8.9	0.0	857
1999	0.0	29.7	33.8	0.2	0.1	26.7	9.4	0.1	964
2000	0.1	41.9	33.9	0.0	0.4	11.4	12.3	0.0	747
2001	0.4	29.3	48.6	0.2	0.2	16.5	4.8	0.2	564
2002	0.3	33.9	38.1	0.3	1.5	19.3	6.6	0.1	746
2003	0.7	37.3	26.1	0.0	0.2	29.3	6.5	0.0	1,298
2004	0.1	43.7	18.9	0.1	0.2	32.6	4.3	0.0	908
2005	0.7	38.8	32.7	0.0	0.3	18.7	8.8	0.1	1,278
2006	0.5	35.3	30.5	0.0	0.4	27.4	5.8	0.0	720
2007	0.7	44.8	25.3	0.0	0.2	19.3	9.9	0.0	628
2008	0.4	39.5	38.3	0.0	0.2	17.9	3.7	0.0	448
2009	0.0	8.5	60.4	0.3	0.0	17.2	13.6	0.0	331
Ave. (1969–2008)	0.3	34.1	35.0	0.2	0.2	20.7	8.8	0.1	1,036

Table 17.—Average lengths of the major age classes sampled from the Kasilof River fish wheel, 1980–2009.

Year	Age Class	Male			Female			Total			Ratio Male-Female	Male			Female			Total			Ratio Male-Female
		Ave Length (mm)	Sample Size	Ave Length (mm)		Age Class	Ave Length (mm)	Sample Size													
1980	1.2	474	189	464	376	467	565	0.5:1	1.3	531	35	516	115	520	150	0.3:1					
1981		503	241	492	146	499	387	1.7:1		566	422	558	369	562	791	1.1:1					
1982		481	285	466	235	474	520	1.2:1		549	377	542	428	545	805	0.9:1					
1983		493	113	491	78	492	191	1.4:1		558	170	547	187	552	357	0.9:1					
1984		480	544	478	428	479	972	2.6:1		539	304	533	383	535	687	0.8:1					
1985		474	723	472	897	473	1620	0.8:1		531	341	527	433	529	774	0.8:1					
1986		482	266	482	368	482	634	0.7:1		550	342	543	405	546	747	0.8:1					
1987		472	282	470	257	471	539	1.1:1		553	191	551	154	552	345	1.2:1					
1988		480	353	477	480	478	833	0.7:1		550	311	543	382	546	693	0.8:1					
1989		476	77	476	107	476	184	0.8:1		552	233	544	253	547	486	0.9:1					
1990		462	139	458	91	460	230	1.5:1		518	81	523	106	521	187	0.8:1					
1991		467	326	461	305	464	631	1.1:1		531	418	518	335	525	753	1.3:1					
1992		468	184	465	212	467	396	0.9:1		535	195	527	197	531	392	1.0:1					
1993		479	40	479	53	479	93	0.8:1		550	101	542	69	547	170	1.5:1					
1994		465	96	466	95	465	191	1.0:1		539	102	530	103	535	205	1.0:1					
1995		491	117	483	141	487	258	0.8:1		542	42	534	49	538	91	0.9:1					
1996		476	96	475	83	475	179	1.2:1		565	214	557	134	562	348	1.6:1					
1997		456	80	452	80	454	160	1.0:1		555	223	541	192	548	415	1.2:1					
1998		475	178	468	162	472	340	1.1:1		527	110	525	131	526	241	0.8:1					
1999		479	140	474	146	476	286	1.0:1		543	167	542	159	542	326	1.1:1					
2000		481	162	474	162	478	324	1.0:1		555	140	547	122	551	262	1.2:1					
2001		479	77	477	88	478	165	0.9:1		549	149	545	125	547	274	1.2:1					
2002		486	114	476	139	480	253	0.8:1		555	144	544	140	549	284	1.1:1					
2003		481	230	480	247	481	477	0.9:1		546	167	546	207	546	374	0.8:1					
2004		482	181	475	216	478	397	0.8:1		549	82	539	90	544	172	0.9:1					
2005		470	260	468	350	469	610	0.7:1		544	142	543	149	543	291	1:1					
2006		464	112	458	148	461	260	0.8:1		519	111	513	114	516	225	1.0:1					
2007		468	127	464	154	466	281	0.8:1		545	77	538	82	542	159	0.9:1					
2008		456	100	454	103	455	203	1.0:1		539	67	533	61	536	128	1.1:1					
2009		483	15	485	13	484	28	1.2:1		547	96	542	104	545	200	0.9:1					
Ave. (1980–2008)		476	201	472	219	474	420	0.9:1		544	188	538	196	541	384	1.0:1					

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Table 17.–Page 2 of 2.

Year	Age Class	Male			Female			Total			Ratio Male-Female	Male			Female			Total			Ratio Male-Female
		Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Age Class	Ave Length (mm)	Sample Size		Ave Length (mm)	Sample Size								
1980	2.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1981		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1982		479	65	472	81	475	146	0.8:1		548	41	543	40	546	81	1.0:1					
1983		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1984		484	202	482	223	483	425	0.9:1		533	102	526	80	530	182	1.3:1					
1985		482	248	476	319	479	567	0.8:1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1986		492	78	489	115	490	193	0.7:1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1987		478	137	474	141	476	278	1.0:1		548	37	541	44	544	81	0.8:1					
1988		486	173	479	220	482	393	0.8:1		544	104	543	115	543	219	0.9:1					
1989		479	200	480	253	479	453	0.8:1		535	94	537	82	536	176	1.1:1					
1990		453	104	457	111	455	215	0.9:1		514	63	529	61	522	124	1.0:1					
1991		471	289	480	301	475	590	1.0:1		516	61	514	64	515	125	1.0:1					
1992		464	264	465	427	464	691	0.6:1		534	112	532	122	533	234	0.9:1					
1993		486	58	480	102	482	160	0.7:1		542	66	533	78	537	144	0.8:1					
1994		469	96	470	108	470	204	0.9:1		545	49	528	74	535	123	0.7:1					
1995		492	61	485	86	488	147	0.7:1		546	42	536	48	541	90	0.9:1					
1996		482	69	472	85	476	154	0.8:1		553	21	556	19	554	40	1.1:1					
1997		459	47	450	55	454	102	0.9:1		546	39	526	42	536	81	0.9:1					
1998		473	95	469	95	471	190	1.0:1		523	40	519	36	521	76	1.1:1					
1999		480	125	475	132	477	257	1.0:1		538	41	530	50	534	91	0.8:1					
2000		486	36	482	52	483	88	0.7:1		551	47	551	48	551	95	1.0:1					
2001		482	41	473	52	477	93	0.8:1		556	17	540	10	550	27	1.7:1					
2002		480	50	470	94	473	144	0.5:1		550	25	546	24	548	49	1.0:1					
2003		481	162	479	186	480	348	0.9:1		546	39	537	53	541	92	0.7:1					
2004		482	126	475	170	478	296	0.7:1		536	25	523	14	531	39	1.8:1					
2005		478	109	467	165	472	274	0.7:1		544	40	533	48	539	88	0.8:1					
2006		464	82	466	120	465	202	0.7:1		527	21	521	22	524	43	1.0:1					
2007		465	53	462	68	463	121	0.8:1		526	36	517	26	522	62	1.4:1					
2008		462	41	458	56	460	97	0.7:1		532	11	501	6	520	17	1.8:1					
2009		481	23	480	34	481	57	0.7:1		544	24	531	21	538	45	1.1:1					
Ave. (1982–2008)		477	116	473	147	474	263	0.8:1		539	49	532	50	536	99	1.0:1					
2009 (all ages)		531	159	524	172	527	331	0.9:1													

Table 18.—Estimated minimum and maximum escapement ranges of salmon passage into the Yentna River drainage, 7 July–12 August, 2009.

Date	Sockeye Salmon				Pink Salmon			
	Daily		Cumulative		Daily		Cumulative	
	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	69	169	69	169	48	161	48	161
8 Jul	99	228	168	397	45	180	92	341
9 Jul	117	264	285	661	60	252	153	593
10 Jul	209	523	494	1,184	114	432	267	1,025
11 Jul	275	893	769	2,077	370	1,077	637	2,102
12 Jul	481	1,610	1,250	3,687	755	2,022	1,392	4,124
13 Jul	893	3,197	2,143	6,884	1,840	4,623	3,232	8,746
14 Jul	1,331	4,543	3,473	11,427	2,722	6,498	5,954	15,244
15 Jul	2,042	5,983	5,516	17,411	2,879	7,471	8,833	22,715
16 Jul	4,082	11,728	9,598	29,139	5,436	14,336	14,270	37,051
17 Jul	5,279	14,148	14,877	43,286	5,060	15,601	19,329	52,653
18 Jul	1,949	8,459	16,826	51,746	10,762	19,276	30,092	71,929
19 Jul	1,500	6,244	18,326	57,990	9,992	17,400	40,083	89,328
20 Jul	1,577	6,089	19,904	64,078	9,102	16,839	49,186	106,168
21 Jul	1,669	6,535	21,573	70,613	11,281	20,878	60,467	127,045
22 Jul	1,402	5,817	22,975	76,430	10,749	19,145	71,216	146,190
23 Jul	1,481	5,332	24,456	81,763	7,674	15,280	78,890	161,470
24 Jul	1,357	5,503	25,813	87,265	14,955	27,715	93,845	189,185
25 Jul	778	3,692	26,591	90,957	15,599	27,419	109,445	216,603
26 Jul	583	2,829	27,175	93,786	12,257	22,027	121,702	238,630
27 Jul	477	2,074	27,652	95,860	9,760	16,995	131,462	255,625
28 Jul	796	3,613	28,447	99,473	12,281	22,634	143,742	278,259
29 Jul	1,382	5,858	29,829	105,331	16,976	31,570	160,718	309,829
30 Jul	2,963	7,676	32,792	113,007	3,165	11,615	163,883	321,444
31 Jul	1,194	3,374	33,987	116,382	1,796	6,127	165,679	327,570
1 Aug	1,277	4,755	35,264	121,137	6,347	14,242	172,026	341,813
2 Aug	1,998	7,836	37,262	128,973	20,126	40,260	192,152	382,073
3 Aug	1,713	6,605	38,975	135,578	35,320	67,092	227,472	449,165
4 Aug	1,412	5,324	40,387	140,901	25,378	64,420	252,849	513,585
5 Aug	661	2,521	41,047	143,422	17,109	44,936	269,958	558,521
6 Aug	625	2,381	41,672	145,803	13,798	31,957	283,756	590,478
7 Aug	601	2,216	42,272	148,019	9,805	24,802	293,561	615,281
8 Aug	649	2,343	42,922	150,362	9,246	23,732	302,807	639,013
9 Aug	388	1,346	43,309	151,708	3,688	13,517	306,495	652,530
10 Aug	284	953	43,594	152,661	1,579	6,209	308,074	658,739
11 Aug	176	593	43,770	153,255	899	3,850	308,973	662,589
12 Aug	202	656	43,972	153,910	910	3,286	309,883	665,875
% Total			10.2	12.7			72.2	54.8

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Table 18.–Page 2 of 2.

Date	Chum Salmon				Coho Salmon			
	Daily		Cumulative		Daily		Cumulative	
	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	0	0	0	0	5	43	5	43
8 Jul	0	0	0	0	2	18	7	62
9 Jul	0	0	0	0	17	133	25	195
10 Jul	0	0	0	0	1	12	26	206
11 Jul	18	56	18	56	18	185	43	391
12 Jul	44	140	62	195	19	214	63	605
13 Jul	30	99	92	294	81	852	144	1,457
14 Jul	29	95	121	389	98	1,079	242	2,536
15 Jul	136	427	257	816	110	1,188	352	3,724
16 Jul	81	256	338	1,072	235	2,527	586	6,251
17 Jul	150	468	487	1,540	375	3,778	962	10,029
18 Jul	134	457	622	1,998	256	2,899	1,217	12,928
19 Jul	130	441	751	2,439	389	3,993	1,607	16,921
20 Jul	178	582	929	3,020	496	4,825	2,102	21,747
21 Jul	235	783	1,164	3,803	726	6,721	2,828	28,468
22 Jul	213	703	1,377	4,506	557	5,424	3,385	33,892
23 Jul	172	563	1,549	5,068	623	5,543	4,008	39,434
24 Jul	373	1,218	1,922	6,287	1,268	11,017	5,275	50,451
25 Jul	354	1,163	2,276	7,449	1,171	10,551	6,447	61,002
26 Jul	224	747	2,500	8,196	1,010	8,934	7,456	69,936
27 Jul	190	622	2,690	8,818	808	6,866	8,264	76,802
28 Jul	401	1,306	3,091	10,124	985	8,836	9,249	85,638
29 Jul	565	1,826	3,656	11,950	1,335	12,075	10,584	97,713
30 Jul	578	1,682	4,234	13,632	1,099	7,478	11,683	105,191
31 Jul	242	711	4,476	14,343	600	4,038	12,283	109,229
1 Aug	416	1,301	4,892	15,644	754	6,187	13,037	115,415
2 Aug	706	2,284	5,599	17,928	2,399	18,455	15,435	133,870
3 Aug	701	2,326	6,300	20,254	4,750	33,452	20,186	167,322
4 Aug	1,925	5,863	8,225	26,117	9,579	47,555	29,764	214,877
5 Aug	1,734	5,167	9,958	31,284	7,084	34,515	36,849	249,392
6 Aug	1,512	4,473	11,470	35,757	3,582	20,569	40,431	269,961
7 Aug	1,815	5,115	13,285	40,872	3,047	17,066	43,477	287,027
8 Aug	2,887	7,618	16,172	48,490	3,363	16,843	46,841	303,870
9 Aug	2,952	7,049	19,124	55,538	2,814	12,808	49,654	316,678
10 Aug	1,774	4,116	20,897	59,654	1,373	6,357	51,027	323,035
11 Aug	1,320	2,988	22,218	62,642	988	4,378	52,015	327,414
12 Aug	830	1,912	23,048	64,553	521	2,818	52,536	330,232
% Total			5.4%	5.3%			12.2%	27.2%

Table 19.—Cumulative proportion by date of sockeye salmon passage recorded in the Yentna River, 1992–2009.

Date	1992	1993	1994	1995	1996	1997 ^a	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009 ^b
07 Jul	0.002	0.001	0.002	0.001	0.001	0.004	0.003	0.000	0.007	0.005	0.029	0.004	0.002	0.007	0.004	0.000	0.001	0.001
08 Jul	0.003	0.002	0.004	0.001	0.003	0.006	0.006	0.001	0.013	0.010	0.101	0.007	0.004	0.017	0.006	0.001	0.002	0.003
09 Jul	0.005	0.004	0.008	0.002	0.005	0.009	0.010	0.002	0.020	0.015	0.155	0.010	0.006	0.021	0.009	0.001	0.004	0.004
10 Jul	0.007	0.005	0.010	0.003	0.007	0.011	0.017	0.005	0.024	0.023	0.187	0.014	0.007	0.028	0.013	0.002	0.006	0.008
11 Jul	0.008	0.006	0.013	0.004	0.007	0.013	0.030	0.010	0.033	0.029	0.207	0.018	0.008	0.035	0.018	0.002	0.007	0.013
12 Jul	0.010	0.007	0.016	0.005	0.009	0.016	0.043	0.017	0.046	0.041	0.226	0.023	0.010	0.041	0.022	0.002	0.010	0.024
13 Jul	0.012	0.008	0.020	0.006	0.011	0.030	0.051	0.024	0.075	0.050	0.236	0.051	0.011	0.057	0.024	0.004	0.013	0.045
14 Jul	0.016	0.009	0.022	0.006	0.013	0.087	0.056	0.031	0.124	0.058	0.251	0.126	0.014	0.081	0.026	0.004	0.017	0.074
15 Jul	0.022	0.014	0.024	0.007	0.022	0.149	0.059	0.044	0.263	0.068	0.271	0.192	0.092	0.109	0.027	0.005	0.068	0.113
16 Jul	0.035	0.134	0.026	0.007	0.131	0.197	0.064	0.057	0.407	0.098	0.328	0.239	0.263	0.131	0.031	0.006	0.148	0.189
17 Jul	0.062	0.284	0.029	0.012	0.348	0.229	0.072	0.068	0.490	0.184	0.446	0.261	0.377	0.147	0.042	0.009	0.228	0.281
18 Jul	0.086	0.360	0.056	0.022	0.519	0.254	0.094	0.081	0.600	0.270	0.535	0.316	0.457	0.165	0.087	0.013	0.299	0.336
19 Jul	0.120	0.382	0.115	0.068	0.614	0.280	0.159	0.108	0.730	0.359	0.570	0.372	0.519	0.205	0.160	0.015	0.387	0.377
20 Jul	0.148	0.420	0.167	0.160	0.671	0.316	0.239	0.160	0.849	0.414	0.628	0.489	0.555	0.242	0.217	0.040	0.538	0.416
21 Jul	0.184	0.464	0.250	0.251	0.702	0.367	0.304	0.222	0.910	0.423	0.684	0.611	0.573	0.273	0.239	0.091	0.636	0.459
22 Jul	0.229	0.513	0.297	0.335	0.745	0.434	0.327	0.319	0.950	0.429	0.734	0.678	0.593	0.303	0.257	0.160	0.700	0.497
23 Jul	0.296	0.574	0.333	0.378	0.784	0.492	0.338	0.433	0.969	0.480	0.754	0.706	0.619	0.326	0.285	0.251	0.779	0.531
24 Jul	0.373	0.647	0.397	0.426	0.822	0.544	0.357	0.510	0.978	0.563	0.783	0.747	0.657	0.365	0.307	0.320	0.821	0.567
25 Jul	0.447	0.709	0.426	0.496	0.856	0.606	0.378	0.567	0.984	0.630	0.807	0.783	0.681	0.430	0.325	0.374	0.851	0.591
26 Jul	0.519	0.763	0.517	0.580	0.880	0.668	0.403	0.605	0.989	0.704	0.820	0.813	0.711	0.485	0.353	0.417	0.862	0.609
27 Jul	0.606	0.810	0.557	0.678	0.899	0.697	0.426	0.653	0.994	0.803	0.835	0.844	0.722	0.516	0.390	0.450	0.868	0.623
28 Jul	0.674	0.831	0.599	0.743	0.913	0.722	0.454	0.702	0.996	0.880	0.855	0.865	0.729	0.532	0.459	0.514	0.878	0.646
29 Jul	0.734	0.857	0.662	0.796	0.928	0.743	0.493	0.767	0.996	0.921	0.871	0.881	0.739	0.555	0.564	0.564	0.890	0.684
30 Jul	0.794	0.893	0.712	0.832	0.941	0.767	0.560	0.804	0.997	0.944	0.891	0.892	0.756	0.581	0.630	0.589	0.897	0.734
31 Jul	0.825	0.927	0.750	0.852	0.943	0.795	0.622	0.848	0.999	0.954	0.906	0.909	0.781	0.628	0.698	0.603	0.907	0.756
01 Aug	0.858	0.938	0.788	0.875	0.948	0.826	0.684	0.878	1.000	0.970	0.918	0.941	0.792	0.677	0.733	0.619	0.914	0.787
02 Aug	0.881	0.950	0.830	0.897	0.954	0.852	0.762	0.895		0.985	0.931	0.963	0.809	0.718	0.769	0.647	0.924	0.838
03 Aug	0.896	0.967	0.862	0.915	0.965	0.870	0.830	0.914		0.991	0.947	0.977	0.826	0.766	0.825	0.687	0.939	0.881
04 Aug	0.910	0.985	0.889	0.928	0.981	0.893	0.876	0.934		0.994	0.964	0.983	0.851	0.792	0.867	0.725	0.959	0.915
05 Aug	0.915	0.992	0.919	0.944	0.991	0.911	0.907	0.947		1.000	0.979	0.990	0.882	0.810	0.897	0.743	0.973	0.932
06 Aug	0.922	0.996	0.942	0.975	0.996	0.923	0.927	0.955			0.990	1.000	0.910	0.844	0.919	0.758	0.981	0.947
07 Aug	0.929	1.000	0.962	0.990	1.000	0.931	0.938	0.963			0.996		0.934	0.895	0.948	0.790	0.986	0.962
08 Aug	0.941		0.974	0.992		0.945	0.947	0.971			1.000		0.953	0.917	0.970	0.826	0.989	0.977
09 Aug	0.966		0.984	0.996		0.961	0.953	0.978					0.968	0.948	0.982	0.871	0.994	0.986
10 Aug	0.984		0.992	1.000		0.982	0.959	0.988					0.981	0.968	0.989	0.898	1.000	0.992

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Table 19.–Page 2 of 2.

Date	1992	1993	1994	1995	1996	1997 ^a	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009 ^b
11 Aug	1.000		0.996			0.992	0.966	0.994					0.993	0.979	0.994	0.933		0.995
12 Aug			1.000			1.000	0.973	0.997					1.000	0.992	1.000	0.975		1.000
13 Aug							0.979	0.999						1.000			0.991	
14 Aug							0.984	1.000									0.994	
15 Aug							0.986										0.997	
16 Aug							0.988									1.000		
17 Aug							0.991											
18 Aug							0.993											
19 Aug							0.996											
20 Aug							0.998											
21 Aug							1.000											
Midpoint:	26 Jul	22 Jul	26 Jul	26 Jul	18 Jul	24 Jul	30 Jul	24 Jul	18 Jul	24 Jul	18 Jul	21 Jul	19 Jul	27 Jul	29 Jul	28 Jul	20 Jul	23 Jul
Average (1981–2008):	24 Jul																	
No. days:																		
for 80% ^a	17	16	19	15	13	22	18	16	8	13	24	17	22	25	19	21	16	21
Average 1981–2008:	16 d																	

^a Inclusive dates: date proportion of passage reached 10% through date proportion reached 90%.^b Proportions averaged from minimum and maximum daily sonar estimates.

Table 20.—Summary of apportioned Bendix sonar counts for the north bank of the Yentna River, 1985–2008, and DIDSON range estimates, 2009.

Year	Sonar Count North Bank					Total	%
	Sockeye	Pink	Chum	Coho	Chinook		
1985	9,805	31,610	4,053	1,258	110	46,836	18.8
1986	9,825	235,458	13,681	6,061	535	265,560	31.6
1987	6,444	12,550	778	4,422	206	24,400	14.0
1988	3,290	27,161	11,222	1,126	148	42,947	17.1
1989	11,649	41,420	30,160	6,193	142	89,564	24.9
1990	3,226	22,569	4,655	1,381	120	31,951	7.3
1991	8,298	19,191	8,276	8,999	96	44,860	17.0
1992	3,518	33,455	6,625	2,556	37	46,191	12.7
1993	5,666	45,620	6,352	4,878	92	62,608	14.4
1994	9,804	16,631	4,021	2,604	66	33,126	13.2
1995	6,663	18,227	6,520	4,557	179	36,146	10.9
1996	18,994	39,206	7,575	10,656	199	76,630	31.2
1997	17,835	12,002	4,076	2,334	126	36,373	17.0
1998	61,416	77,094	4,673	8,322	258	151,763	48.9
1999	25,366	23,518	4,560	9,889	286	63,619	30.5
2000	29,458	103,834	4,065	9,391	205	146,953	34.6
2001	31,360	129,961	14,390	12,353	346	188,410	50.6
2002	19,511	190,644	13,654	16,713	891	241,413	40.6
2003	52,811	63,118	11,504	8,380	218	136,031	32.1
2004	4,540	39,550	3,403	14,644	431	62,568	15.6
2005	6,395	22,157	3,065	16,777	123	48,517	28.5
2006	10,022	127,951	4,836	28,397	281	171,487	33.0
2007	7,648	33,616	2,043	11,325	82	54,714	28.1
2008	13,572	51,372	2,922	8,776	308	76,950	30.8
Ave. (1985–08):	15,713	59,080	7,380	8,416	229	90,817	26.3
% of Ave.:	4.5	17.1	2.1	2.4	0.1	26.3	—
Min.: (1985–08):	3,226	12,002	778	1,126	37	24,400	7.3
Max. (1985–08):	61,416	235,458	30,160	28,397	891	265,560	50.6
Std Dev:	15,093	58,362	6,192	6,332	185	68,988	—
2009	North Bank Total Sonar Estimate:					318,289	39.7
	Sockeye:	7,154–29,347					
	Pink:	176,924–288,643					
	Chum:	8,028–23,609					
	Coho:	11,136–98,310					
	Chinook:	ND					

Note: DIDSON range estimates by bank for 2009 are provided at the bottom.

Table 21.—Summary of apportioned Bendix sonar counts for the south bank of the Yentna River, 1985–2008, and DIDSON range estimates, 2009.

Year	Passage Count - South Bank					%
	Pink	Chum	Coho	Chinook	Total	
1985	89,380	8,039	7,923	294	202,955	81.2
1986	438,444	42,975	17,396	579	576,085	68.4
1987	71,549	5,499	13,436	201	150,293	86.0
1988	109,873	11,044	37,835	297	208,106	82.9
1989	132,278	33,219	19,502	251	269,870	75.1
1990	222,000	28,911	19,965	487	408,427	92.7
1991	56,186	13,379	48,276	108	219,283	83.0
1992	205,907	23,436	26,516	70	318,485	87.3
1993	181,551	21,669	32,874	271	372,393	85.6
1994	62,547	14,950	22,569	160	218,454	86.8
1995	85,763	24,953	69,849	167	295,289	89.1
1996	59,030	13,481	24,764	146	169,087	68.8
1997	16,958	8,595	11,336	171	177,047	83.0
1998	78,099	5,539	16,447	247	158,539	51.1
1999	38,876	3,353	28,044	767	144,703	69.5
2000	139,282	2,958	31,396	462	277,734	65.4
2001	87,162	9,178	34,724	403	183,639	49.4
2002	224,014	11,663	58,377	367	353,501	59.4
2003	104,266	18,845	36,842	249	288,204	67.9
2004	180,796	13,012	77,699	1,327	339,575	84.4
2005	24,276	6,688	60,112	105	121,707	71.5
2006	154,969	6,909	102,555	276	347,583	67.0
2007	33,298	6,077	28,632	26	140,286	71.9
2008	64,140	7,290	25,008	76	173,088	69.2
Ave. (1985–08):	119,194	14,236	35,503	313	254,764	73.7
% of Ave.:	34.5	4.1	10.3	0.1	73.7	—
Min.: (1985–08):	16,958	2,958	7,923	26	121,707	49.4
Max. (1985–08):	438,444	42,975	102,555	1,327	576,085	92.7
Std Dev (1985–08) :	92,067	10,250	23,197	278	108,242	—
2009	Total South Bank Sonar Estimate:				484,140	60.3
Sockeye:	36,817–124,563					
Pink:	132,959–377,232					
Chum:	15,020–40,945					
Coho:	41,400–231,922					
Chinook:	ND					

Note: DIDSON range estimates by bank for 2009 are provided at the bottom.

Table 22.—Daily fish wheel catch for the north bank of the Yentna River, 2009.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
7 Jul	17.4	1	1	4	4	0	0	0	0	1	1
8 Jul	17.7	4	5	6	10	0	0	0	0	2	3
9 Jul	17.5	8	13	16	26	0	0	2	2	2	5
10 Jul	18.1	16	29	32	58	0	0	0	2	2	7
11 Jul	17.4	15	44	55	113	1	1	2	4	7	14
12 Jul	17.4	15	59	123	236	2	3	3	7	1	15
13 Jul	17.8	19	78	231	467	1	4	9	16	2	17
14 Jul	17.4	15	93	284	751	1	5	5	21	3	20
15 Jul	17.7	13	106	421	1,172	5	10	8	29	2	22
16 Jul	17.8	28	134	586	1,758	1	11	14	43	2	24
17 Jul	17.8	33	167	710	2,468	3	14	26	69	0	24
18 Jul	17.0	19	186	1,426	3,894	8	22	16	85	2	26
19 Jul	17.1	5	191	1,052	4,946	4	26	10	95	2	28
20 Jul	17.5	7	198	1,075	6,021	4	30	18	113	0	28
21 Jul	18.0	13	211	1,688	7,709	17	47	32	145	0	28
22 Jul	17.8	26	237	1,933	9,642	17	64	40	185	0	28
23 Jul	17.6	35	272	1,902	11,544	19	83	55	240	0	28
24 Jul	17.5	11	283	1,394	12,938	14	97	50	290	0	28
25 Jul	17.4	12	295	1,659	14,597	13	110	64	354	0	28
26 Jul	17.4	15	310	2,109	16,706	24	134	91	445	0	28
27 Jul	17.4	12	322	2,410	19,116	15	149	79	524	0	28
28 Jul	16.1	20	342	1,846	20,962	26	175	93	617	1	29
29 Jul	17.1	71	413	3,918	24,880	54	229	199	816	1	30
30 Jul	17.3	189	602	776	25,656	37	266	111	927	1	31
31 Jul	17.8	137	739	728	26,384	20	286	83	1,010	0	31
1 Aug	17.1	119	858	2,543	28,927	60	346	120	1,130	0	31
2 Aug	17.0	50	908	3,950	32,877	69	415	135	1,265	1	32
3 Aug	10.5	6	914	3,090	35,967	41	456	81	1,346	0	32
4 Aug	12.2	23	937	2,932	38,899	85	541	166	1,512	0	32
5 Aug	16.3	23	960	3,894	42,793	123	664	253	1,765	1	33
6 Aug	16.5	19	979	2,822	45,615	78	742	133	1,898	0	33
7 Aug	17.4	20	999	2,419	48,034	93	835	134	2,032	0	33
8 Aug	17.1	8	1,007	1,160	49,194	95	930	56	2,088	0	33
9 Aug	17.3	17	1,024	605	49,799	141	1,071	87	2,175	0	33
10 Aug	17.8	14	1,038	358	50,157	85	1,156	75	2,250	0	33
11 Aug	17.6	12	1,050	239	50,396	59	1,215	62	2,312	0	33
12 Aug	17.8	11	1,061	275	50,671	47	1,262	51	2,363	0	33
% Total:		1.9		91.5		2.3		4.3		0.1	
Total Catch: 55,390 salmon				Hrs Operated: 631.4		CPUE (fish/hr): 87.7					

Table 23.—Daily fish wheel catch for the south bank of the Yentna River, 2009.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
7 Jul	17.0	17	17	27	27	0	0	3	3	1	1
8 Jul	17.4	19	36	52	79	0	0	2	5	2	3
9 Jul	17.0	31	67	82	161	0	0	3	8	4	7
10 Jul	17.2	68	135	145	306	0	0	1	9	0	7
11 Jul	17.8	82	217	343	649	5	5	4	13	1	8
12 Jul	17.2	120	337	404	1,053	10	15	3	16	1	9
13 Jul	17.6	159	496	678	1,731	5	20	12	28	2	11
14 Jul	17.3	218	714	822	2,553	4	24	18	46	0	11
15 Jul	17.8	311	1,025	897	3,450	18	42	19	65	3	14
16 Jul	17.9	422	1,447	1,115	4,565	8	50	25	90	3	17
17 Jul	17.7	670	2,117	1,690	6,255	18	68	57	147	2	19
18 Jul	17.3	301	2,418	2,096	8,351	16	84	43	190	2	21
19 Jul	16.6	232	2,650	1,830	10,181	17	101	72	262	3	24
20 Jul	17.5	228	2,878	1,604	11,785	23	124	82	344	0	24
21 Jul	18.0	230	3,108	1,837	13,622	22	146	114	458	2	26
22 Jul	18.4	230	3,338	1,821	15,443	24	170	97	555	0	26
23 Jul	17.1	364	3,702	2,171	17,614	27	197	165	720	1	27
24 Jul	17.3	229	3,931	2,551	20,165	43	240	207	927	1	28
25 Jul	17.9	82	4,013	1,694	21,859	30	270	116	1,043	0	28
26 Jul	17.4	78	4,091	1,930	23,789	18	288	131	1,174	0	28
27 Jul	17.5	64	4,155	1,211	25,000	20	308	108	1,282	0	28
28 Jul	16.8	119	4,274	1,623	26,623	38	346	102	1,384	0	28
29 Jul	17.3	319	4,593	2,381	29,004	77	423	155	1,539	0	28
30 Jul	16.0	355	4,948	1,066	30,070	68	491	60	1,599	0	28
31 Jul	17.8	494	5,442	2,283	32,353	135	626	379	1,978	0	28
1 Aug	17.7	401	5,843	2,655	35,008	99	725	272	2,250	1	29
2 Aug	16.9	407	6,250	5,282	40,290	93	818	567	2,817	1	30
3 Aug	10.8	68	6,318	1,713	42,003	15	833	215	3,032	0	30
4 Aug	13.9	81	6,399	1,970	43,973	60	893	527	3,559	0	30
5 Aug	16.1	67	6,466	2,476	46,449	106	999	682	4,241	1	31
6 Aug	16.6	87	6,553	2,684	49,133	161	1,160	548	4,789	0	31
7 Aug	16.8	94	6,647	2,390	51,523	219	1,379	514	5,303	0	31
8 Aug	16.8	101	6,748	1,599	53,122	247	1,626	491	5,794	0	31
9 Aug	17.3	44	6,792	942	54,064	201	1,827	343	6,137	2	33
10 Aug	17.6	31	6,823	310	54,374	113	1,940	135	6,272	0	33
11 Aug	17.1	36	6,859	410	54,784	188	2,128	190	6,462	0	33
12 Aug	17.4	42	6,901	429	55,213	126	2,254	107	6,569	0	33
% Total:		9.7		77.8		3.2		9.3		0.0	
Total catch: 70,970 salmon				Hrs Operated:		629.9		CPUE (fish/hr):		112.7	

Table 24.—Summary of fish wheel catch and CPUE for the north bank of the Yentna River, 1982–2009.

Year	Total Hours	Actual fish wheel catch North Bank										CPUE by species					Total CPUE	
		Sockeye	%	Pink	%	Chum	%	Coho	%	Chinook	%	Total Catch	Sockeye	Pink	Chum	Coho	Chinook	
1982	1,467.5	904	9.1	7,568	76.3	893	9.0	528	5.3	25	0.3	9,918	0.6	5.2	0.2	0.4	0.0	6.8
1983	1,564.5	933	22.0	2,667	62.8	384	9.0	213	5.0	50	1.2	4,247	0.6	1.7	0.5	0.1	0.0	2.7
1984	828.0	514	6.3	7,141	87.1	448	5.5	88	1.1	9	0.1	8,200	0.6	8.6	0.7	0.1	0.0	9.9
1985	702.5	1,099	17.5	4,415	70.4	502	8.0	241	3.8	14	0.2	6,271	1.6	6.3	0.6	0.3	0.0	8.9
1986	573.2	219	4.9	3,571	80.6	362	8.2	194	4.4	83	1.9	4,429	0.4	6.2	0.9	0.3	0.1	7.7
1987	936.4	1,393	25.5	2,983	54.5	876	16.0	172	3.1	47	0.9	5,471	1.5	3.2	2.8	0.2	0.1	5.8
1988	517.2	981	16.6	3,320	56.2	1,433	24.2	137	2.3	39	0.7	5,910	1.9	6.4	4.6	0.3	0.1	11.4
1989	790.2	2,016	13.8	8,099	55.3	3,669	25.1	803	5.5	46	0.3	14,633	2.6	10.2	2.3	1.0	0.1	18.5
1990	517.6	867	11.5	5,246	69.5	1,165	15.4	248	3.3	27	0.4	7,553	1.7	10.1	1.8	0.5	0.1	14.6
1991	530.1	768	16.2	2,071	43.8	946	20.0	932	19.7	15	0.3	4,732	1.4	3.9	2.3	1.8	0.0	8.9
1992	582.6	693	8.2	5,867	69.7	1,345	16.0	499	5.9	13	0.2	8,417	1.2	10.1	1.4	0.9	0.0	14.4
1993	399.1	931	13.9	4,789	71.3	549	8.2	432	6.4	17	0.3	6,718	2.3	12.0	1.5	1.1	0.0	16.8
1994	492.1	1,374	28.6	2,309	48.0	734	15.3	379	7.9	10	0.2	4,806	2.8	4.7	1.6	0.8	0.0	9.8
1995	511.8	815	17.8	2,343	51.0	826	18.0	587	12.8	19	0.4	4,590	1.6	4.6	0.9	1.1	0.0	9.0
1996	472.4	708	16.0	2,815	63.6	409	9.2	481	10.9	13	0.3	4,426	1.5	6.0	0.6	1.0	0.0	9.4
1997	849.5	2,294	48.1	1,610	33.8	551	11.6	301	6.3	14	0.3	4,770	2.7	1.9	1.0	0.4	0.0	5.6
1998	1,094.1	12,067	37.7	17,057	53.3	1,102	3.4	1,712	5.4	54	0.2	31,992	11.0	15.6	1.0	1.6	0.0	29.2
1999	206.0	1,004	33.5	1,301	43.4	211	7.0	464	15.5	16	0.5	2,996	4.9	6.3	1.2	2.3	0.1	14.5
2000	133.9	904	14.8	4,710	76.9	155	2.5	345	5.6	9	0.1	6,123	6.8	35.2	3.5	2.6	0.1	45.7
2001	145.1	898	13.6	4,705	71.4	501	7.6	477	7.2	13	0.2	6,594	6.2	32.4	3.2	3.3	0.1	45.4
2002	161.7	564	6.3	7,286	80.9	516	5.7	618	6.9	17	0.2	9,001	3.5	45.1	3.4	3.8	0.1	55.7
2003	179.5	2,331	34.5	3,367	49.9	602	8.9	442	6.5	12	0.2	6,754	13.0	18.8	1.4	2.5	0.1	37.6
2004	243.3	394	5.8	4,613	68.1	338	5.0	1,406	20.8	22	0.3	6,773	1.6	19.0	0.8	5.8	0.1	27.8
2005	314.3	582	13.2	2,131	48.5	250	5.7	1,420	32.3	13	0.3	4,396	1.9	6.8	0.8	4.5	0.0	14.0
2006	640.8	1,472	5.7	19,480	75.0	705	2.7	4,295	16.5	27	0.1	25,979	2.3	30.4	1.1	6.7	0.0	40.5
2007	242.9	554	14.4	2,349	61.1	152	4.0	786	20.4	6	0.2	3,847	2.3	9.7	0.6	3.2	0.0	15.8
2008	197.3	752	13.8	3,949	72.6	194	3.6	528	9.7	18	0.3	5,441	3.8	20.0	1.0	2.7	0.1	27.6
2009	631.4	1,061	1.9	50,671	91.5	1,262	2.3	2,363	4.3	33	0.1	55,390	1.7	80.3	2.0	3.7	0.1	87.7
Average (%): (1982–08)		17.7		64.1		9.2		8.7		0.3			2.5	9.0	1.3	1.2	0.0	14.1
Minimum (%): (1982–08)		4.9		33.8		2.5		1.1		0.1			0.4	1.7	0.2	0.1	0.0	2.7
Maximum (%): (1982–08)		48.1		87.1		25.1		32.3		1.9			13.0	45.1	4.6	6.7	0.1	55.7
Std Dev: (1982–08)		10.9		13.5		6.4		7.3		0.4			3.0	11.2	1.1	1.8	0.0	14.5

Table 25.—Summary of the fish wheel catch and CPUE for the south bank of the Yentna River, 1982–2009.

Year	Total Hours	Actual fish wheel catch South Bank										CPUE by species					Total CPUE	
		Sockeye	%	Pink	%	Chum	%	Coho	%	Chinook	%	Total Catch	Sockeye	Pink	Chum	Coho	Chinook	
1982	1440.0	2,502	19.7	9,059	71.3	368	2.9	675	5.3	102	0.8	12,706	1.7	6.3	0.3	0.5	0.1	8.8
1983	1506.5	3,715	58.7	1,822	28.8	391	6.2	361	5.7	37	0.6	6,326	2.5	1.2	0.3	0.2	0.0	4.2
1984	788.3	5,985	29.5	13,114	64.6	635	3.1	568	2.8	12	0.1	20,314	7.6	16.6	0.8	0.7	0.0	25.8
1985	883.1	5,616	35.7	8,855	56.2	521	3.3	724	4.6	35	0.2	15,751	6.4	10.0	0.6	0.8	0.0	17.8
1986	608.8	973	13.3	5,422	73.9	589	8.0	327	4.5	28	0.4	7,339	1.6	8.9	1.0	0.5	0.0	12.1
1987	824.2	2,216	32.5	3,333	48.8	966	14.1	293	4.3	20	0.3	6,828	2.7	4.0	1.2	0.4	0.0	8.3
1988	529.4	2,457	26.9	4,536	49.6	1,635	17.9	494	5.4	20	0.2	9,142	4.6	8.6	3.1	0.9	0.0	17.3
1989	818.1	3,856	27.7	7,169	51.5	1,804	12.9	1,081	7.8	23	0.2	13,932	4.7	8.8	2.2	1.3	0.0	17.0
1990	542.2	4,201	32.2	7,058	54.1	1,129	8.6	657	5.0	11	0.1	13,056	7.7	13.0	2.1	1.2	0.0	24.1
1991	445.0	5,368	42.7	3,368	26.8	877	7.0	2,936	23.4	10	0.1	12,559	12.1	7.6	2.0	6.6	0.0	28.2
1992	612.87	3,887	22.2	9,966	56.8	1,940	11.1	1,737	9.9	9	0.1	17,539	6.3	16.3	3.2	2.8	0.0	28.6
1993	446.5	8,561	34.7	12,416	50.3	1,508	6.1	2,178	8.8	25	0.1	24,688	19.2	27.8	3.4	4.9	0.1	55.3
1994	651.3	8,251	55.6	3,763	25.4	1,260	8.5	1,553	10.5	12	0.1	14,839	12.7	5.8	1.9	2.4	0.0	22.8
1995	456.3	2,737	36.3	2,335	31.0	691	9.2	1,766	23.4	11	0.1	7,540	6.0	5.1	1.5	3.9	0.0	16.5
1996	306.5	2,498	28.7	4,335	49.7	752	8.6	1,119	12.8	15	0.2	8,719	8.1	14.1	2.5	3.7	0.0	28.4
1997	318.2	5,431	79.5	672	9.8	317	4.6	397	5.8	18	0.3	6,835	17.1	2.1	1.0	1.2	0.1	21.5
1998	1114.4	14,394	34.5	21,258	51.0	1,667	4.0	4,326	10.4	50	0.1	41,695	12.9	19.1	1.5	3.9	0.0	37.4
1999	206.3	3,790	42.4	3,213	35.9	223	2.5	1,689	18.9	34	0.4	8,949	18.4	15.6	1.1	8.2	0.2	43.4
2000	125.4	2,611	19.6	9,494	71.4	123	0.9	1,051	7.9	15	0.1	13,294	20.8	75.7	1.0	8.4	0.1	106.0
2001	157.7	2,527	27.7	4,369	47.8	460	5.0	1,755	19.2	20	0.2	9,131	16.0	27.7	2.9	11.1	0.1	57.9
2002	140.7	2,716	14.8	11,590	63.3	712	3.9	3,274	17.9	16	0.1	18,308	19.3	82.4	5.1	23.3	0.1	130.2
2003	146.7	6,095	44.9	4,927	36.3	869	6.4	1,659	12.2	15	0.1	13,565	41.5	33.6	5.9	11.3	0.1	92.5
2004	203.0	2,712	17.4	8,147	52.3	835	5.4	3,832	24.6	43	0.3	15,569	13.4	40.1	4.1	18.9	0.2	76.7
2005	277.6	2,588	26.2	2,280	23.1	571	5.8	4,433	44.9	12	0.1	9,884	9.3	8.2	2.1	16.0	0.0	35.6
2006	636.4	9,277	26.4	15,261	43.4	862	2.5	9,747	27.7	34	0.1	35,181	14.6	24.0	1.4	15.3	0.1	55.3
2007	240.4	2,998	51.8	1,410	24.4	261	4.5	1,117	19.3	2	0.0	5,788	12.5	5.9	1.1	4.6	0.0	24.1
2008	210.7	2,696	36.9	3,245	44.4	349	4.8	1,022	14.0	4	0.1	7,316	12.8	15.4	1.7	4.9	0.0	34.7
2009	629.9	6,901	9.7	55,213	77.8	2,254	3.2	6,569	9.3	33	0.0	70,970	11.0	87.7	3.6	10.4	0.1	112.7
Average (%): (1982–08)		32.0		48.4		5.9		13.5		0.2			8.2	12.5	1.5	3.5	0.0	25.7
Minimum (%): (1982–08)		13.3		9.8		0.9		2.8		0.0			1.6	2.1	0.6	0.4	0.0	8.3
Maximum (%): (1982–08)		79.5		73.9		17.9		44.9		0.8			41.5	82.4	5.9	23.3	0.2	130.2
Std Dev (%): (1982–08)		14.8		16.4		3.9		9.7		0.2			8.3	20.7	1.4	6.4	0.1	31.5

Table 26.—Age composition of sockeye salmon sampled from fish wheels on the Yentna River, 1983–2009.

Year	Percentage Composition by Age Class										Sample Size
	0.2	0.3	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	
1983	0.4	0.4	4.7	66.9	22.6	0.2	0.9	1.7	1.7	0.0	0.5
1984	0.2	1.6	1.3	23.7	59.6	0.1	0.3	6.5	6.7	0.0	0.0
1985	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1986	1.0	1.1	0.0	21.2	65.3	0.2	0.3	4.7	6.2	0.0	0.0
1987	1.3	2.4	0.9	23.3	50.6	1.0	0.0	8.6	11.7	0.0	0.0
1988	2.7	2.4	0.4	33.5	41.9	0.2	1.7	6.5	10.4	0.1	0.0
1989	4.1	6.2	0.7	20.3	53.7	0.3	0.5	5.5	8.6	0.0	0.0
1990	0.8	2.4	0.3	29.9	47.6	0.7	0.1	9.8	8.2	0.1	0.2
1991	2.1	10.6	0.1	25.2	43.6	0.1	0.1	7.1	11.0	0.1	0.1
1992	1.6	0.7	1.0	31.4	29.2	0.1	0.4	17.1	18.2	0.1	0.4
1993	1.0	4.6	0.1	32.1	35.5	0.0	0.4	11.7	14.5	0.1	0.0
1994	1.3	3.9	0.6	23.2	43.2	0.2	0.0	9.7	17.6	0.0	0.3
1995	2.2	5.1	0.8	19.7	51.3	0.4	0.2	8.5	11.6	0.0	0.2
1996	3.2	3.2	0.4	25.5	43.8	0.0	0.4	9.4	14.0	0.0	0.0
1997	1.1	10.5	0.1	32.4	43.7	0.1	0.1	4.7	7.2	0.0	0.1
1998	0.7	5.7	0.3	15.7	62.7	0.3	0.0	4.0	10.5	0.0	0.0
1999	3.6	3.4	0.0	23.4	52.0	0.9	0.0	8.6	8.1	0.0	0.0
2000	0.0	5.9	0.0	8.6	61.5	0.2	0.0	3.3	20.2	0.2	0.0
2001	0.0	3.4	0.8	21.3	47.8	0.0	0.4	8.4	17.7	0.0	0.2
2002	1.7	2.0	0.7	28.8	51.0	0.0	0.0	5.5	10.2	0.0	0.2
2003	0.5	2.5	0.1	16.1	63.6	0.4	0.5	6.0	10.3	0.0	0.0
2004	0.6	1.1	0.7	17.0	50.0	0.6	0.0	8.3	21.7	0.0	0.0
2005	0.5	4.0	1.7	22.7	54.4	0.1	0.1	6.2	10.1	0.0	0.2
2006	2.2	3.1	0.5	44.0	39.3	0.2	0.0	5.0	5.8	0.0	0.0
2007	1.9	3.6	0.3	18.9	60.9	0.0	0.6	6.3	7.4	0.0	0.1
2008	0.8	6.3	1.6	11.8	56.0	0.5	1.1	7.6	13.9	0.0	0.4
2009	2.9	2.9	1.5	33.9	31.6	0.8	2.1	17.2	7.2	0.0	0.0
Mean (1983–2008)	1.5	3.8	0.8	25.8	48.6	0.3	0.4	7.6	11.2	0.0	0.1
											896

Table 27.—Length composition of the major age classes of sockeye salmon sampled from the Yentna River fish wheels, 1983–2009.

Year	Age Class	Male		Female		Both		Ratio Male Female
		Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	
1983	1.2	473	377	484	308	478	685	1.2:1
1984–85		ND	ND	ND	ND	ND	ND	ND
1986		455	104	472	52	460	156	2.0:1
1987		484	158	477	156	480	314	1.0:1
1988		465	408	485	170	471	578	2.4:1
1989		454	239	479	89	461	328	2.7:1
1990		446	305	446	238	446	543	1.3:1
1991		460	253	484	130	468	383	1.9:1
1992		444	360	470	115	450	475	3.1:1
1993		465	279	484	167	472	446	1.7:1
1994		468	107	484	41	473	148	2.6:1
1995		460	58	472	42	465	100	1.4:1
1996		463	78	469	41	465	119	1.9:0
1997		479	110	479	133	479	243	0.8:1
1998		485	104	486	132	486	236	0.8:1
1999		469	56	484	48	476	104	1.2:1
2000		462	35	458	12	461	47	2.9:1
2001		477	53	490	48	483	101	1.1:1
2002		486	76	495	56	490	132	1.4:1
2003		473	77	486	54	478	131	1.4:1
2004		466	53	490	25	474	78	2.1:1
2005		456	125	466	62	459	187	2.0:1
2006		485	134	487	132	486	266	1.0:1
2007		455	43	483	26	466	69	1.7:1
2008		456	40	482	5	459	45	8.0:1
2009		472	139	488	86	478	225	1.6:1
Average (1986–2008)		466	142	479	86	470	227	1.7:1
1983	1.3	577	134	548	98	565	232	1.4:1
1984–85		ND	ND	ND	ND	ND	ND	ND
1986		579	172	563	216	570	388	0.8:1
1987		590	246	565	222	579	468	1.1:1
1988		583	365	551	359	568	724	1.0:1
1989		578	392	555	450	565	842	0.9:1
1990		573	400	552	526	561	926	0.8:1
1991		562	301	542	356	551	657	0.8:1
1992		546	188	543	242	544	430	0.8:1
1993		561	228	549	266	554	494	0.9:1
1994		596	133	561	142	578	275	0.9:1
1995		568	124	545	136	556	260	0.9:1
1996		589	107	568	97	579	204	1.1:1
1997		585	155	555	173	569	328	0.9:1
1998		562	453	538	487	550	940	0.9:1
1999		581	135	553	96	569	231	1.4:1
2000		600	180	568	156	585	336	1.2:1
2001		586	111	555	116	570	227	1.0:1
2002		596	113	561	121	578	234	0.9:1
2003		576	270	548	246	563	516	1.1:1
2004		574	93	553	137	562	230	0.7:1
2005		568	222	546	226	557	448	1.0:1
2006		567	99	554	139	559	238	0.7:1
2007		575	109	552	114	563	223	1.0:1
2008		571	99	555	115	563	214	0.9:1
2009		580	92	557	118	567	210	0.8:1
Average (1986–2008)		576	204	554	223	565	428	0.9:1

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Table 27.-Page 2 of 2.

Year	Age Class	Male		Female		Both		Ratio Male Female
		Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	
1983	2.2	490	13	507	5	495	18	2.6:1
1984-85		ND	ND	ND	ND	ND	ND	ND
1986		462	23	539	18	496	41	1.3:1
1987		480	48	490	76	487	124	0.6:1
1988		474	75	491	38	481	113	2.0:1
1989		479	45	490	48	485	93	0.9:1
1990		462	91	455	100	459	191	0.9:1
1991		478	57	477	50	478	107	1.1:1
1992		452	181	471	53	456	234	3.4:1
1993		476	93	487	69	481	162	1.3:1
1994		487	30	490	32	488	62	0.9:1
1995		472	23	488	20	479	43	1.2:1
1996		472	21	498	23	486	44	0.9:1
1997		497	15	460	20	475	35	0.8:1
1998		482	36	487	24	484	60	1.5:1
1999		483	16	491	22	487	38	0.7:1
2000		470	10	477	8	473	18	1.3:1
2001		487	19	482	21	485	40	0.9:1
2002		482	16	486	9	483	25	1.8:1
2003		472	23	486	26	480	49	0.9:1
2004		474	24	486	14	478	38	1.7:1
2005		462	29	488	22	473	51	1.3:1
2006		500	17	490	13	496	30	1.3:1
2007		471	8	493	15	486	23	0.5:1
2008		468	19	495	10	477	29	1.9:1
2009		492	73	495	41	493	114	1.8:1
Average (1987-2008)		476	40	487	32	481	72	1.3:1
1983	2.3	564	10	544	7	556	17	1.4:1
1984-85		ND	ND	ND	ND	ND	ND	ND
1986		588	25	555	44	567	69	0.6:1
1987		583	62	565	52	576	114	1.2:1
1988		587	92	558	87	574	179	1.1:1
1989		565	68	549	75	557	143	0.9:1
1990		574	73	542	96	555	169	0.8:1
1991		561	78	536	86	547	164	0.9:1
1992		564	123	538	126	551	249	1.0:1
1993		562	74	544	128	550	202	0.6:1
1994		600	56	561	56	580	112	1.0:1
1995		578	25	544	34	559	59	0.7:1
1996		585	31	558	34	571	65	0.9:1
1997		575	34	548	20	565	54	1.7:1
1998		558	82	534	76	547	158	1.1:1
1999		585	16	546	20	563	36	0.8:1
2000		597	55	563	55	580	110	1.0:1
2001		575	34	552	50	561	84	0.7:1
2002		589	21	551	26	568	47	0.8:1
2003		562	50	543	34	555	84	1.5:1
2004		579	41	551	59	560	100	0.7:1
2005		557	32	537	51	545	83	0.6:1
2006		562	13	553	22	556	35	0.6:1
2007		568	12	544	15	555	27	0.8:1
2008		565	26	535	27	550	53	1.0:1
2009		560	18	548	30	553	48	0.6:1
Average (1986-2008)		574	49	548	55	561	104	0.9:1
2009 summary (all ages)		502	373	525	291	512	664	1.3:1

Table 28.—Late run sockeye salmon escapement weir counts and surveys in 8 index streams, Kenai River drainage, 1969–2009.

Year	Railroad Creek ^b	Johnson Creek ^b	Carter Moose Creek ^b	Ptarmigan Creek ^b	Tern (Mud) Lake ^b	Quartz Creek ^c		Hidden Lake ^d	Above Weir	Below Weir	Russian River ^a
	ground	ground	ground	ground	ground	weir	ground	weir	weir	ground	Total Index Area
1969	100	75	598	ND	437	ND	487	500	28,872	1,100	32,169
1970	99	118	348	ND	561	ND	200	323	26,200	222	28,071
1971	194	160	3,201	45	1,370	ND	808	1,958	54,421	11,442	73,599
1972	700	150	3,400	ND	1,200	ND	ND	4,956	79,115	7,113	96,634
1973	521	1,714	660	1,041	1,731	ND	3,173	690	25,068	6,680	41,278
1974	ND	46	942	558	1,216	ND	288	1,150	24,904	2,210	31,314
1975	572	105	1,278	186	1,214	ND	1,068	1,375	31,961	690	38,449
1976	1,162	ND	5,558	505	1,548	ND	3,372	4,860	31,939	3,470	52,414
1977	1,262	350	6,515	1,513	2,230	ND	3,037	1,055	21,362	17,090	54,414
1978	1,749	780	1,933	3,529	1,216	ND	10,627	4,647	34,334	18,330	77,145
1979	ND	588	3,986	532	1,693	ND	277	5,762	87,852	3,920	104,610
1980	1,259	253	4,879	5,752	2,575	ND	7,982	27,448	83,984	3,220	137,352
1981	1,286	142	4,363	1,421	3,402	ND	5,998	15,939	44,523	4,160	81,234
1982	2,518	498	4,752	7,525	4,337	70,540	ND	9,790	30,790	45,000	175,750
1983	1,289	338	1,819	9,709	ND	73,345	ND	11,297	33,734	44,000	175,531
1984	2,090	939	5,927	18,000	2,728	37,659	ND	27,784	92,659	3,000	190,786
1985	2,884	151	5,928	26,879	ND	ND	ND	24,784	136,969	8,650	206,245
1986	600	245	1,659	ND	ND	ND	ND	17,530	40,281	15,230	75,545
1987	736	74	628	14,187	ND	ND	45,400	43,487	53,932	76,530	234,974
1988	1,990	1,243	1,607	31,696	ND	ND	ND	50,907	42,476	30,360	160,279
1989	4,959	2,276	5,958	3,484	ND	ND	ND	7,770	138,377	28,480	191,304
1990	ND	ND	2,306	2,230	ND	ND	ND	77,959	83,434	11,760	177,689
1991	ND	ND	750	4,628	1,750 ^e	ND	ND	112,792	78,175	22,267	220,362
1992	ND	ND	1,106	3,147	970 ^e	ND	ND	32,912	62,584	4,980	105,699
1993	ND	ND	ND	ND	ND	ND	ND	11,582	99,259	12,258	123,099
1994	ND	705	ND	1,077	ND	ND	ND	6,086	122,277	15,211	145,356
1995	ND	ND	ND	ND	ND	ND	1,372	7,542	61,982	12,479	83,375
1996	ND	ND	ND	ND	ND	ND	4,181	55,256	34,691	31,601	125,729
1997	ND	ND	ND	ND	ND	ND	27,660	56,053	65,905	11,337	160,955
1998	ND	ND	ND	ND	ND	ND	11,130	67,727	113,480	19,593	211,930
1999	ND	ND	ND	ND	ND	ND	3,951	49,406	139,863	19,514	212,734
2000	ND	ND	ND	ND	ND	ND	1,389	45,685	56,580	13,930	117,584
2001	ND	ND	ND	ND	ND	ND	4,792	42,462	74,964	17,044	139,262
2002	ND	ND	ND	ND	ND	ND	66,294	71,983	62,115	6,858	140,956
2003	ND	ND	ND	ND	ND	ND	19,106	11,734	157,469	27,474	215,783
2004	ND	ND	2,132 ^f	4,428	ND	ND	13,225	18,172	110,244	30,458	178,659
2005	ND	ND	356 ^f	3,036	ND	ND	6,580	13,000 ^g	59,473	29,048	98,493
2006	ND	ND	971 ^f	3,461	ND	ND	28,335	38,535	89,160	18,452	178,914
2007	ND	ND	ND	1,938	ND	ND	38,954	16,718	53,068	4,504	115,182
2008	ND	ND	ND	5,530	ND	ND	16,622	13,715	46,638	9,750	92,255
2009	ND	ND	ND	3,980	ND	ND	11,262	11,011	80,088	10,740	117,081

Note: type of survey method is provided in the heading.

^a Late run sockeye counts provided by ADF&G, Division of Sport Fish, Soldotna (Berkhahn) 2009. In some instances, numbers are rounded.

^b United States Department of Agriculture, Forest Service, Seward, Alaska (1984–1992, 1994).

^c ADF&G, Fisheries Rehabilitation and Enhancement Division weir count (1982–84), CFD ground survey, 1995–2005.

^d Weir count: 1971, 1973, 1976–1989 (FRED Division); 1990–2005 (Cook Inlet Aquaculture Association).

^e Survey conducted on an unnamed stream at eastern end of Tern (Mud) Lake.

^f ADF&G, Division of Commercial Fisheries ground survey 2004–2005.

^g Count is incomplete, hole discovered in weir on 8/11.

Table 29.—Historical sockeye salmon weir counts from Susitna River watershed lakes, 1981–2009.

Year	Sockeye Salmon Weir Counts											
	Chelatna	Shell	Judd	Larson	Stephan	Byers	Swan	Red Shirt	Trapper	Fish	Deshka	
1981	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1982	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1983	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1984	ND	ND	ND	35,254	ND	ND	ND	ND	ND	ND	ND	ND
1985	ND	ND	ND	37,874	ND	ND	ND	ND	ND	ND	ND	ND
1986	ND	4,237	ND	32,322	ND	ND	ND	ND	ND	ND	ND	ND
1987	ND	ND	ND	16,753	ND	ND	ND	ND	ND	ND	ND	ND
1988	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1989	ND	ND	12,792	ND	ND	ND	ND	ND	ND	ND	ND	ND
1990	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1991	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1992	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1993	20,235	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1994	28,303	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1995	20,124	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,388
1996	35,747	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	416
1997	84,899	ND	ND	40,282	ND	ND	ND	ND	ND	ND	ND	614
1998	51,798	ND	34,416	63,514	ND	ND	ND	ND	ND	ND	ND	107
1999	ND	ND	ND	18,943	ND	ND	ND	ND	ND	ND	ND	60
2000	ND	ND	ND	11,987	ND	ND	ND	ND	ND	ND	ND	36
2001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	94
2002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	39
2003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	80
2004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
2005	ND	ND	ND	9,751	ND	ND	ND	ND	ND	ND	ND	41
2006	18,433	69,747	40,630	57,411	ND	3,071	ND	ND	ND	ND	ND	0
2007	41,290	26,784	58,134	47,736	4,320	1,701	5,509	ND	ND	ND	ND	0
2008	73,469	2,624	54,304	35,040	5,000	1,492	4,037	ND	ND	ND	ND	0
2009	17,865	4,961	43,153	41,929	ND	ND	ND	0	0	548	0	

Table 30.—Index of stream surveys or weir counts of various Northern District spawning areas, 2009.

	Number of Fish Observed or Estimated				
	Sockeye	Pink	Chum	Coho	Chinook
Alexander Creek (aerial survey, ADF&G SF)	0	0	0	0	275
Answer Creek (foot survey, ADF&G SF)	0	0	0	166	0
Birch Creek (foot survey, ADF&G SF)	0	0	0	219	0
Bodenburg Creek (foot survey, ADF&G SF)	540	0	0	0	0
Chelatna Lake (weir, CIAA)	17,865	0	0	0	0
Chuitna River (aerial survey, ADF&G CF)	0	0	0	0	1,040
Chulitna River (aerial survey, ADF&G SF)	0	0	0	0	2,093
Coal Creek (aerial survey, ADF&G SF)	0	0	0	0	119
Cottonwood Creek (foot survey, ADF&G, SF)	0	0	0	942	0
Deshka River (weir, ADF&G SF)	0	0	0	27,348	11,967
Fish Creek (weir, ADF&G, SF)	83,480	0	0	8,214	0
Goose Creek (aerial survey, ADF&G, SF)	0	0	0	0	65
Indian River (aerial survey, ADF&G, SF)	0	0	0	0	409
Jim Creek (foot survey, ADF&G, SF)	0	0	0	2,524	0
Judd Lake (weir, CIAA)	43,153	0	0	0	0
Kashwitna River (aerial survey, ADF&G SF)	0	0	0	0	317
Lake Creek (aerial survey, ADF&G CF)	0	0	0	0	1,394
Larson L (weir CIAA)	41,929	0	0	0	0
Lewis River (aerial survey, ADF&G SF)	0	0	0	0	111
Little Susitna (aerial survey, ADF&G SF)	0	0	0	0	1,028
Little Susitna (weir, ADF&G SF)	0	0	0	9,523	0
Little Willow Creek (aerial survey, ADF&G SF)	0	0	0	0	776
Matanuska River, Bartko channel (ADF&G, SF)	0	0	0	440	0
McRoberts Creek (foot survey, ADF&G, SF)	0	0	0	1,331	0
Montana Creek (aerial survey, ADF&G, SF)	0	0	0	0	1,460
Moose Creek (foot survey, ADF&G, SF)	0	0	0	0	201
Packers Creek/Lake (weir, ADF&G, CF)	16,473	0	0	0	0
Peter's Creek (aerial survey, ADF&G, SF)	0	0	0	0	1,283
Portage Creek (aerial survey, ADF&G, SF)	0	0	0	0	1,228
Prairie Creek (aerial survey, ADF&G SF)	0	0	0	0	3,500
Question Creek (foot survey, ADF&G, SF)	0	0	0	9	0
Rabideux Creek (foot survey, ADF&G, SF)	0	0	0	345	0
Sheep Creek (aerial survey, ADF&G SF)	0	0	0	0	500
Shell Lake (weir, CIAA)	4,961	0	0	0	0
Spring Creek, Upper (foot survey, ADF&G SF)	0	0	0	28	0
Spring Creek, flats (foot survey, ADF&G SF)	0	0	0	14	0
Talachulitna River (aerial, ADF&G CF)	0	0	0	0	2,608
Theodore River (aerial, ADF&G CF)	0	0	0	0	352
Wasilla Creek (foot survey, ADF&G, SF)	0	0	0	936	0
Willow Creek (aerial survey, ADF&G, SF)	0	0	0	0	1,133
Wolverine Creek (index count, ADF&G, SF)	0	0	0	150	0

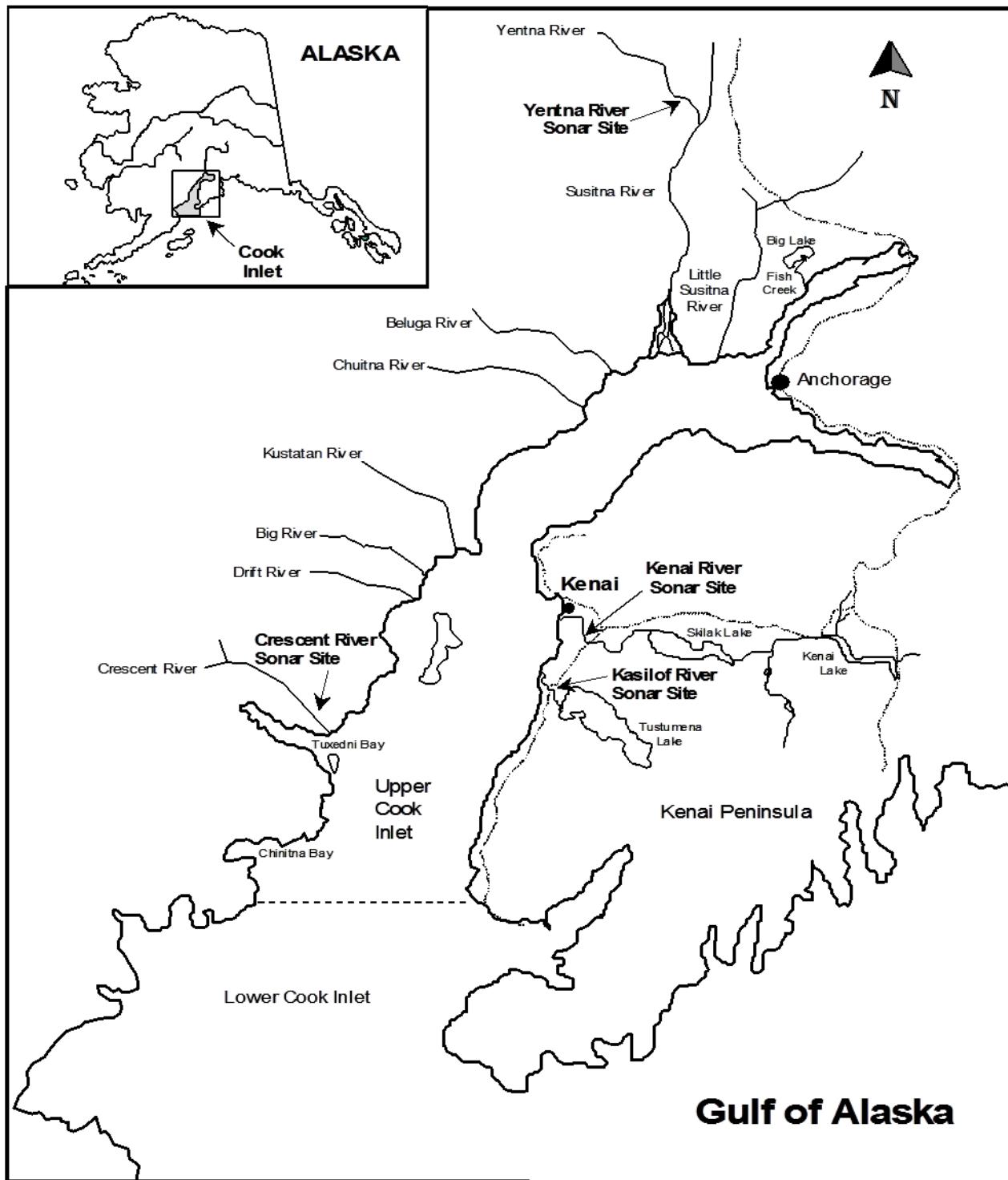


Figure 1.—Map of Upper Cook Inlet, Alaska, showing sites where salmon sonar enumeration projects are conducted.

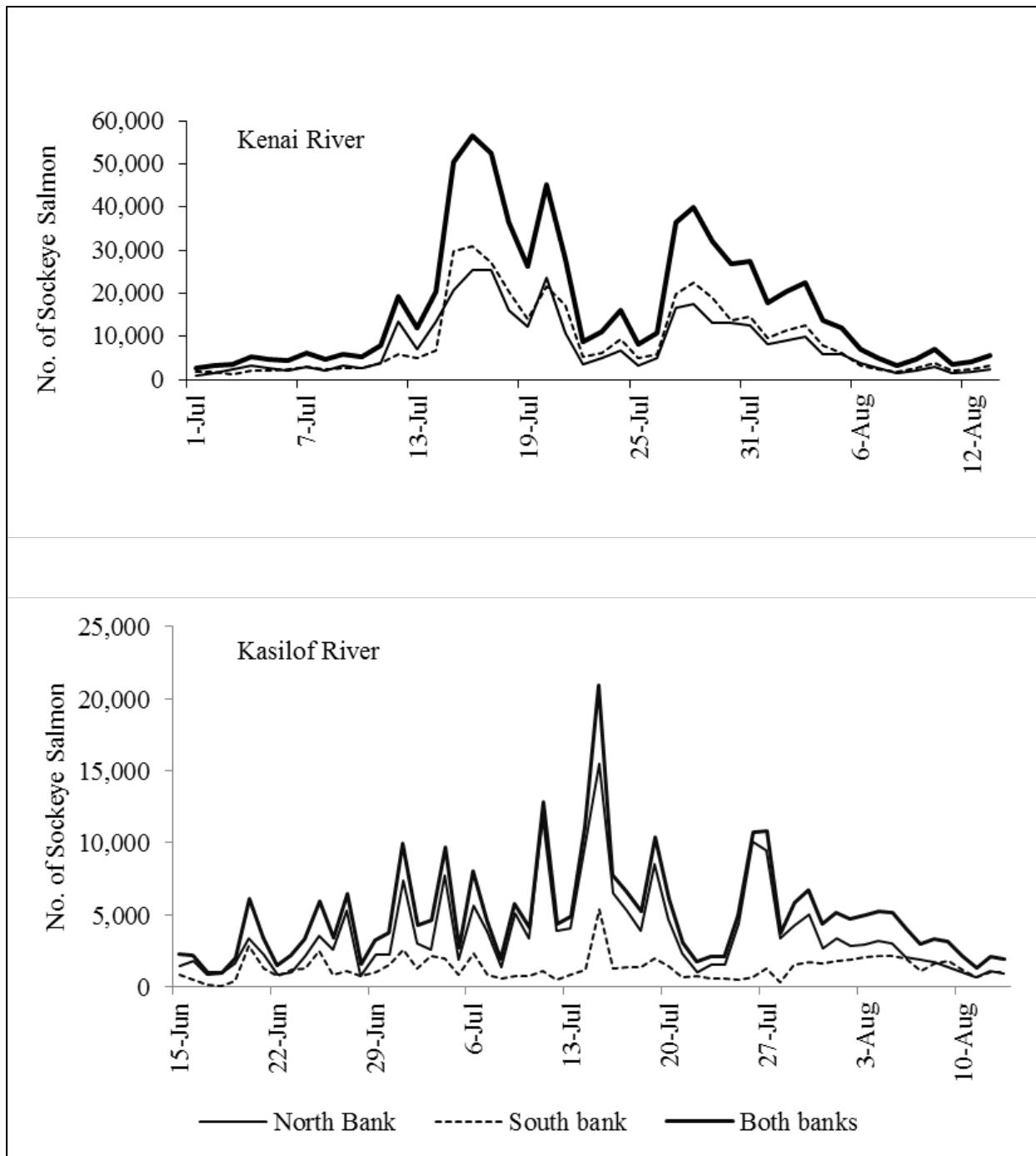
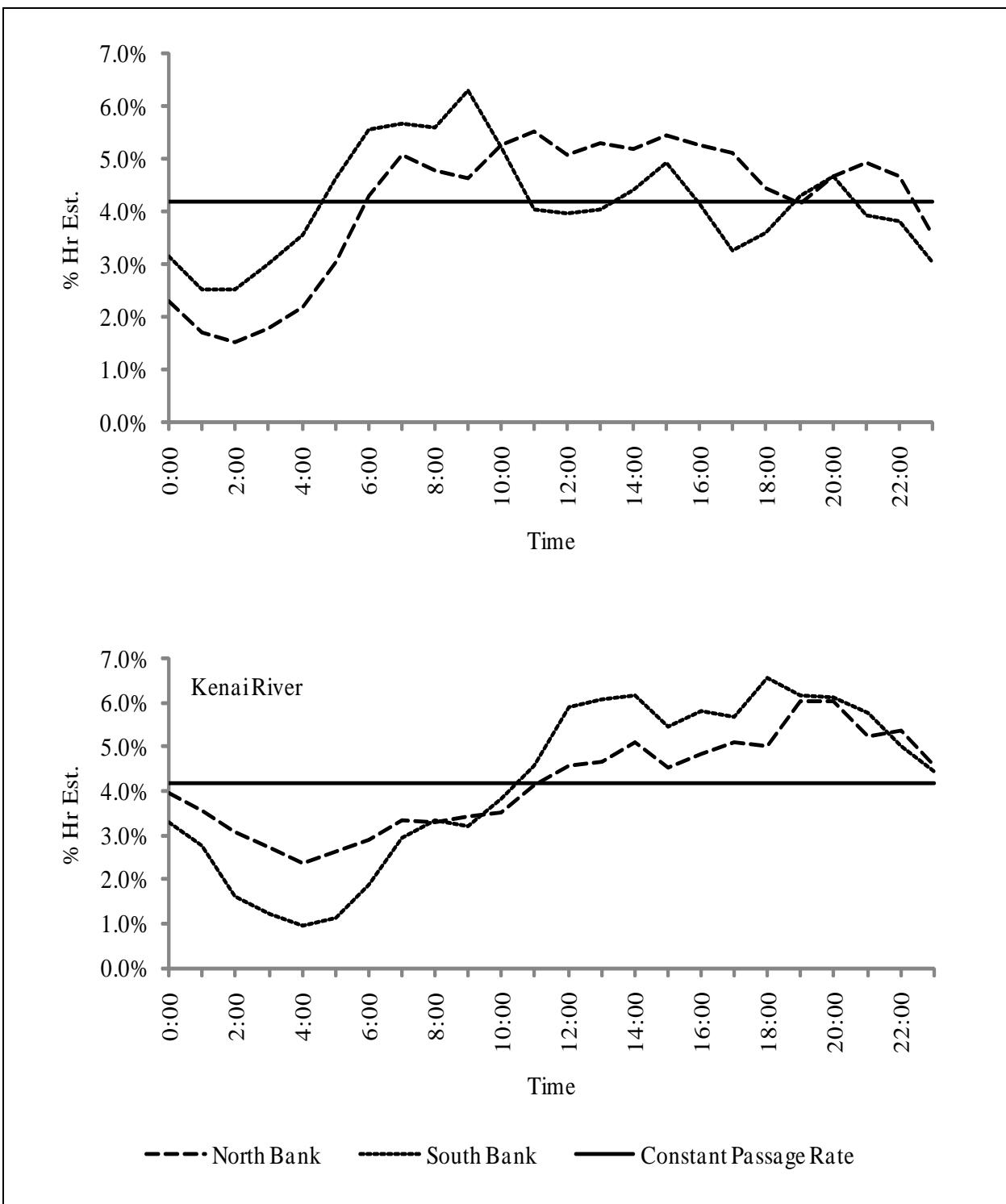


Figure 2.—Total daily sonar counts and counts by bank for sockeye salmon passage in the Kenai and Kasilof rivers, 2009.



Note: Straight line represents a constant passage rate over a 24-hour period.

Figure 3.—Mean hourly passage rates of salmon migrating past the Kasilof (top) and Kenai river (bottom) sonar sites, 2009.

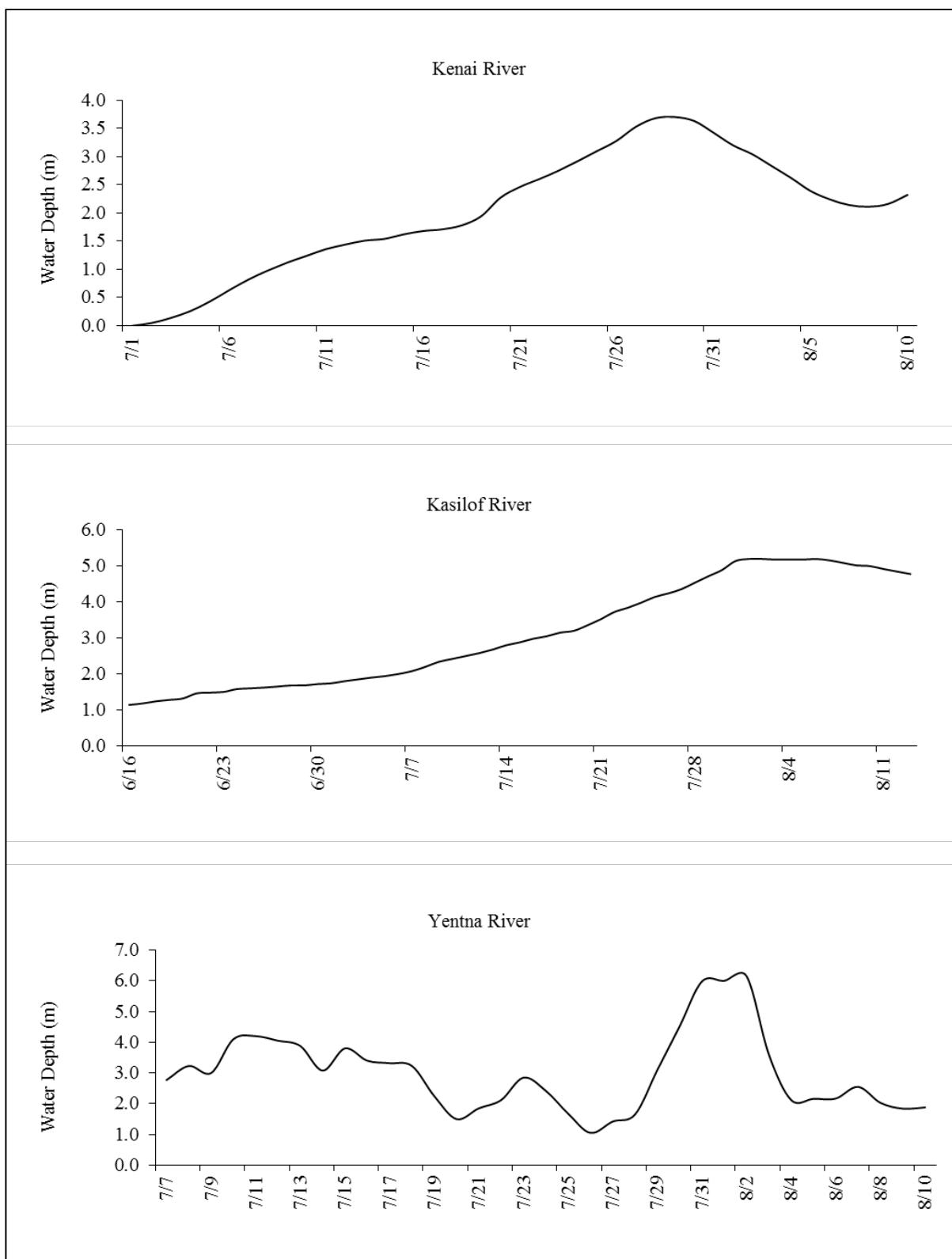
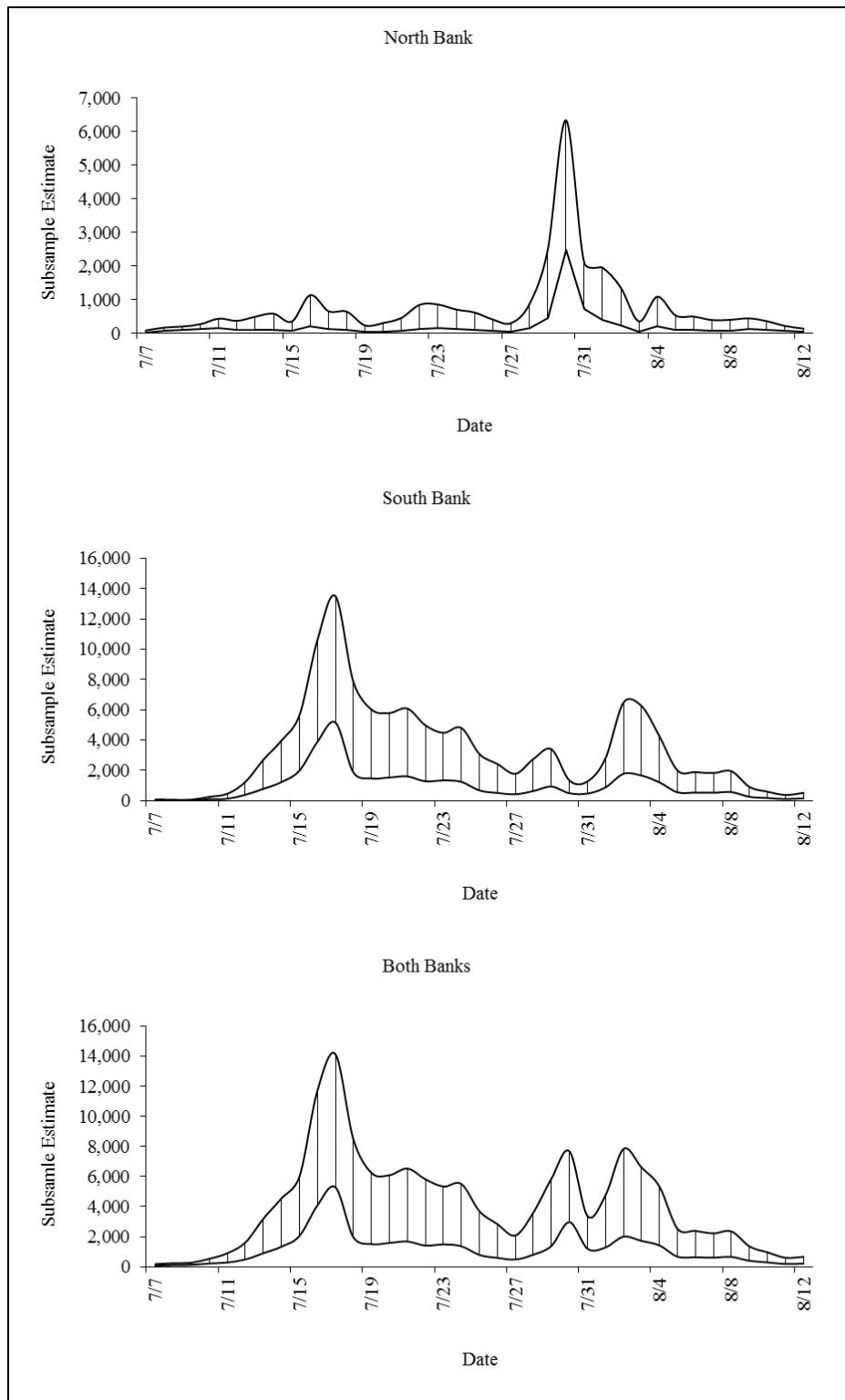


Figure 4.—Daily water level fluctuations for the Kenai, Kasilof, and Yentna rivers, 2009.



Note: The top line represents potential maximum passage and the bottom line represents minimum.

Figure 5.—The daily ranges in migratory timing of sockeye salmon in the Yentna River, 2009.

APPENDIX A: KENAI RIVER DATA

Appendix A1.—Estimated salmon passage along the north bank, Kenai River, 2009.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	985	985	0	0	0	0	0	0
2 Jul	1,570	2,555	0	0	0	0	0	0
3 Jul	2,386	4,941	0	0	0	0	0	0
4 Jul	3,191	8,132	0	0	0	0	0	0
5 Jul	2,718	10,850	0	0	0	0	0	0
6 Jul	2,047	12,897	0	0	0	0	0	0
7 Jul	3,049	15,947	0	0	0	0	0	0
8 Jul	2,097	18,044	0	0	0	0	0	0
9 Jul	3,351	21,395	0	0	0	0	0	0
10 Jul	2,610	24,005	0	0	0	0	0	0
11 Jul	3,920	27,925	0	0	0	0	0	0
12 Jul	13,520	41,445	0	0	0	0	0	0
13 Jul	6,961	48,406	0	0	0	0	0	0
14 Jul	13,465	61,871	0	0	0	0	0	0
15 Jul	20,707	82,578	0	0	0	0	0	0
16 Jul	25,487	108,064	0	0	0	0	0	0
17 Jul	25,385	133,449	0	0	0	0	0	0
18 Jul	16,024	149,473	0	0	0	0	0	0
19 Jul	12,250	161,723	1,178	1,178	0	0	0	0
20 Jul	23,731	185,454	1,249	2,427	0	0	0	0
21 Jul	10,741	196,195	366	2,793	0	0	0	0
22 Jul	3,641	199,836	475	3,268	0	0	0	0
23 Jul	5,072	204,908	0	3,268	0	0	0	0
24 Jul	6,727	211,635	259	3,527	0	0	259	259
25 Jul	3,142	214,777	666	4,193	0	0	0	259
26 Jul	4,955	219,732	881	5,074	0	0	0	259
27 Jul	16,705	236,437	0	5,074	0	0	0	259
28 Jul	17,607	254,045	0	5,074	304	304	0	259
29 Jul	13,069	267,114	307	5,381	0	304	0	259
30 Jul	13,074	280,188	259	5,640	0	304	0	259
31 Jul	12,656	292,844	156	5,796	0	304	0	259
1 Aug	8,127	300,971	262	6,058	262	566	0	259
2 Aug	9,114	310,085	552	6,610	829	1,395	0	259
3 Aug	9,831	319,916	0	6,610	468	1,863	0	259
4 Aug	5,800	325,716	0	6,610	132	1,995	0	259
5 Aug	5,887	331,603	768	7,378	0	1,995	0	259
6 Aug	3,842	335,445	339	7,717	226	2,221	113	372
7 Aug	2,633	338,078	59	7,776	0	2,221	59	430
8 Aug	1,391	339,469	82	7,858	41	2,262	41	471
9 Aug	1,981	341,451	116	7,974	58	2,320	58	530
10 Aug	3,093	344,544	0	7,974	0	2,320	0	530
11 Aug	1,421	345,965	0	7,974	0	2,320	0	530
12 Aug	1,893	347,858	57	8,031	0	2,320	0	530
13 Aug	2,518	350,376	76	8,107	0	2,320	0	530
% Total		97.0		2.2		0.6		0.1
Total estimate		361,332						

Appendix A2.—Estimated salmon passage along the south bank, Kenai River, 2009.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	1,660	1,660	0	0	0	0	0	0
2 Jul	1,743	3,402	0	0	0	0	0	0
3 Jul	1,181	4,583	0	0	0	0	0	0
4 Jul	2,113	6,696	0	0	0	0	0	0
5 Jul	2,032	8,728	0	0	0	0	0	0
6 Jul	2,389	11,117	0	0	0	0	0	0
7 Jul	3,069	14,185	0	0	0	0	0	0
8 Jul	2,510	16,695	0	0	0	0	0	0
9 Jul	2,593	19,288	0	0	0	0	0	0
10 Jul	2,582	21,870	0	0	0	0	0	0
11 Jul	3,916	25,786	0	0	0	0	0	0
12 Jul	5,857	31,643	0	0	0	0	0	0
13 Jul	5,028	36,671	0	0	0	0	0	0
14 Jul	6,860	43,531	0	0	0	0	0	0
15 Jul	29,735	73,266	0	0	0	0	0	0
16 Jul	30,974	104,240	0	0	0	0	0	0
17 Jul	27,010	131,251	0	0	0	0	0	0
18 Jul	20,303	151,554	0	0	0	0	0	0
19 Jul	13,901	165,455	1,337	1,337	0	0	0	0
20 Jul	21,480	186,935	1,131	2,467	0	0	0	0
21 Jul	17,321	204,256	590	3,057	0	0	0	0
22 Jul	5,248	209,504	685	3,742	0	0	0	0
23 Jul	6,129	215,633	0	3,742	0	0	0	0
24 Jul	9,280	224,913	357	4,099	0	387	357	357
25 Jul	4,922	229,835	1,044	5,143	0	387	0	357
26 Jul	5,909	235,744	1,051	6,194	0	387	0	357
27 Jul	19,771	255,515	0	6,194	0	387	0	357
28 Jul	22,470	277,985	0	6,194	387	702	0	357
29 Jul	19,060	297,045	448	6,642	0	1,731	0	357
30 Jul	13,673	310,718	271	6,912	0	2,330	0	357
31 Jul	14,715	325,433	182	7,094	0	2,510	0	357
1 Aug	9,751	335,184	314	7,408	315	2,510	0	357
2 Aug	11,315	346,499	685	8,094	1,029	2,704	0	357
3 Aug	12,569	359,068	0	8,094	599	2,704	0	357
4 Aug	7,904	366,972	0	8,094	180	2,758	0	357
5 Aug	6,091	373,063	794	8,888	0	2,834	0	357
6 Aug	3,299	376,362	291	9,179	194	2,834	97	454
7 Aug	2,382	378,744	53	9,232	0	2,834	53	507
8 Aug	1,812	380,556	107	9,338	54	2,834	53	560
9 Aug	2,605	383,161	153	9,491	77	2,834	77	637
10 Aug	3,899	387,060	0	9,491	0	2,834	0	637
11 Aug	2,229	389,289	0	9,491	0	2,834	0	637
12 Aug	2,364	391,652	72	9,563	0	2,834	0	637
13 Aug	3,142	394,794	95	9,658	0	2,834	0	637
% Total	96.8		2.4		0.7		0.2	
Total estimate	407,924							

Appendix A3.—Kenai River north bank DIDSON estimates (all species) by hour, 2009.

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Jul	40	76	65	54	29	40	105	4	11	7	7	25
2 Jul	137	123	69	119	47	36	65	54	29	47	36	22
3 Jul	94	148	69	76	65	65	65	72	112	47	76	76
4 Jul	327	156	76	80	152	109	87	196	181	116	185	117
5 Jul	54	137	109	80	130	83	58	130	72	145	58	29
6 Jul	123	65	116	87	62	76	80	105	25	33	69	58
7 Jul	51	119	159	318	123	62	98	163	130	80	134	159
8 Jul	94	105	123	62	62	127	123	76	114	36	51	54
9 Jul	76	62	156	137	156	134	174	130	141	145	94	76
10 Jul	127	119	119	87	225	170	152	177	177	174	94	25
11 Jul	51	47	25	25	47	33	119	98	137	116	127	166
12 Jul	583	340	322	326	228	554	905	999	185	1,009	706	662
13 Jul	456	253	134	108	54	174	297	250	376	87	72	148
14 Jul	239	376	210	250	145	138	365	496	282	366	428	265
15 Jul	528	341	192	326	311	358	564	224	637	640	1,075	1,415
16 Jul	1,051	380	1,290	1,046	760	1,002	879	836	370	890	814	785
17 Jul	1,570	1,813	1,754	1,011	1,174	1,393	796	543	1,156	821	798	1,665
18 Jul	416	387	340	959	553	583	387	574	221	648	279	1,299
19 Jul	181	232	282	394	195	192	271	311	326	307	300	449
20 Jul	376	998	586	604	619	716	445	950	687	684	883	977
21 Jul	181	434	525	463	478	217	710	1,071	423	264	409	459
22 Jul	159	94	206	148	72	134	76	181	137	98	116	101
23 Jul	134	213	242	166	210	159	195	199	166	152	282	203
24 Jul	174	91	412	347	319	166	185	166	253	239	456	137
25 Jul	213	83	192	175	112	196	148	181	137	109	65	58
26 Jul	80	163	261	124	69	58	116	90	101	209	145	101
27 Jul	326	583	376	246	213	431	271	507	452	384	658	716
28 Jul	1,042	796	521	257	246	405	387	593	803	745	564	398
29 Jul	955	601	333	214	224	409	380	485	738	463	499	427
30 Jul	991	847	210	192	308	297	358	358	311	546	427	409
31 Jul	362	455	229	280	261	246	231	279	528	250	275	253

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Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
1 Jul	22	7	0	4	4	4	4	25	22	51	246	134
2 Jul	40	7	14	7	18	11	47	54	137	148	87	213
3 Jul	43	25	43	11	22	69	94	109	196	326	276	206
4 Jul	22	164	76	65	69	91	134	206	116	166	199	101
5 Jul	101	83	105	141	170	203	152	163	170	163	124	58
6 Jul	11	72	195	72	275	45	62	105	74	123	43	72
7 Jul	148	297	105	149	105	47	36	130	98	94	120	123
8 Jul	98	94	134	109	72	58	69	58	101	101	116	62
9 Jul	69	138	137	134	90	101	159	148	228	271	185	210
10 Jul	72	62	80	119	69	62	58	98	83	76	130	54
11 Jul	188	112	87	326	138	398	163	134	236	337	438	373
12 Jul	402	807	326	658	1,241	583	636	235	304	561	604	347
13 Jul	257	159	369	322	452	731	394	532	441	326	192	376
14 Jul	716	655	583	644	286	583	1,038	1,682	1,382	1,176	792	369
15 Jul	1,400	1,386	1,740	1,042	905	763	1,089	1,219	1,151	669	1,802	930
16 Jul	952	955	1,686	1,122	1,422	716	1,288	915	1,241	1,780	1,625	1,682
17 Jul	1,042	445	1,058	684	543	423	805	934	984	1,353	1,549	1,071
18 Jul	993	661	763	744	1,412	843	821	832	905	630	449	327
19 Jul	1,082	926	868	886	677	919	601	622	988	829	885	706
20 Jul	1,903	937	1,111	1,104	1,418	2,694	1,792	2,479	1,360	615	415	626
21 Jul	952	850	673	630	564	293	410	268	236	308	192	98
22 Jul	152	308	264	387	174	301	224	192	207	174	152	58
23 Jul	156	94	239	156	156	232	287	217	365	459	217	170
24 Jul	286	539	387	525	663	257	148	294	329	533	225	112
25 Jul	94	177	98	166	259	282	203	105	156	215	130	255
26 Jul	174	134	217	168	172	340	836	582	438	239	503	517
27 Jul	517	800	861	525	441	1,165	1,303	1,436	1,339	554	886	1,715
28 Jul	402	800	488	999	1,013	805	394	1,726	1,400	1,259	767	1,100
29 Jul	315	441	803	478	510	503	644	1114	1368	586	423	463
30 Jul	235	492	499	355	369	749	416	1274	1281	810	1114	485
31 Jul	704	748	495	720	583	626	829	742	832	1158	1098	631

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Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Aug	521	384	123	231	239	116	311	329	330	607	441	369
2 Aug	492	550	184	101	65	65	102	343	233	571	362	542
3 Aug	730	409	182	119	65	36	123	145	240	184	554	698
4 Aug	521	210	203	112	43	33	130	139	318	134	87	83
5 Aug	282	208	234	190	137	157	130	188	449	134	219	413
6 Aug	188	76	98	36	40	54	76	72	246	228	253	297
7 Aug	109	116	130	87	33	43	83	65	228	119	213	109
8 Aug	54	25	43	11	18	14	40	25	47	54	61	40
9 Aug	18	18	22	29	7	11	62	33	43	58	29	119
10 Aug	109	11	22	62	58	112	54	62	87	185	137	148
11 Aug	47	62	51	51	65	51	25	51	61	98	33	94
12 Aug	54	69	36	22	62	69	113	58	62	69	54	94
13 Aug	62	47	25	65	62	51	76	36	83	76	87	213
Total	14,377	12,820	11,056	9,876	8,542	9,573	10,418	12,043	11,850	12,372	12,711	14,955
% Total	4.0	3.5	3.1	2.7	2.4	2.6	2.9	3.3	3.3	3.4	3.5	4.1
% Cum	4.0	7.5	10.6	13.3	15.7	18.3	21.2	24.5	27.8	31.3	34.8	38.9

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Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
1 Aug	242	441	275	282	384	405	268	462	633	268	402	589
2 Aug	695	332	434	282	268	601	492	1,125	939	669	484	564
3 Aug	662	738	868	302	687	760	398	224	568	481	640	485
4 Aug	109	177	485	326	347	387	311	213	318	304	622	318
5 Aug	192	724	821	680	427	224	203	188	105	62	130	159
6 Aug	170	203	420	449	228	253	253	159	250	199	163	109
7 Aug	83	137	145	123	174	116	119	94	105	65	90	163
8 Aug	54	130	87	51	58	90	98	109	130	148	101	65
9 Aug	178	137	108	69	127	231	148	166	98	144	181	177
10 Aug	166	166	109	174	253	137	239	137	213	127	250	76
11 Aug	76	43	58	54	72	62	62	43	40	58	94	72
12 Aug	101	105	36	83	72	69	242	94	98	90	141	58
13 Aug	195	145	112	119	166	152	98	141	170	253	90	69
Total	16,471	16,855	18,464	16,443	17,557	18,381	18,065	21,790	21,833	18,959	19,373	16,549
% Total	4.6	4.7	5.1	4.6	4.9	5.1	5.0	6.0	6.0	5.2	5.4	4.6
% Cum	43.5	48.1	53.2	57.8	62.7	67.7	72.7	78.8	84.8	90.1	95.4	100

Appendix A4.—Kenai River south bank DIDSON estimates (all species) by hour, 2009.

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Jul	103	42	71	24	28	33	19	5	24	28	42	56
2 Jul	71	85	33	19	33	26	22	25	19	19	28	19
3 Jul	33	14	9	14	9	42	19	9	19	19	38	56
4 Jul	28	90	47	19	5	85	52	19	42	80	75	71
5 Jul	85	80	23	33	28	56	61	14	108	89	75	28
6 Jul	52	52	47	28	38	103	19	42	85	28	24	47
7 Jul	57	146	61	80	56	47	52	160	127	57	90	86
8 Jul	38	66	24	47	42	85	52	94	99	127	113	80
9 Jul	66	89	52	24	47	33	75	28	94	57	38	141
10 Jul	71	99	103	103	66	94	80	33	66	47	75	146
11 Jul	85	47	75	61	89	89	70	33	118	94	118	155
12 Jul	155	137	183	94	151	174	174	117	103	226	306	334
13 Jul	94	47	38	33	19	47	75	211	122	216	56	268
14 Jul	132	160	71	113	75	38	103	57	137	160	236	357
15 Jul	179	132	146	108	71	165	282	1,222	875	640	1,472	1,769
16 Jul	1,801	2,102	715	743	325	306	245	532	448	900	1,088	1,900
17 Jul	1,077	1,166	635	729	663	517	1,054	549	616	903	1,580	2,150
18 Jul	1,557	1,689	781	574	357	489	522	682	1,025	734	1,366	748
19 Jul	1,068	437	743	419	99	80	193	394	212	386	245	362
20 Jul	1,449	644	376	155	47	66	419	602	452	522	893	743
21 Jul	870	804	433	151	146	230	461	527	1,082	630	842	1,496
22 Jul	169	198	103	56	61	56	61	108	151	155	113	230
23 Jul	188	47	56	66	24	56	132	52	198	151	202	198
24 Jul	457	484	197	103	127	127	207	657	560	423	202	193
25 Jul	335	146	80	183	56	80	108	211	132	169	155	226
26 Jul	113	113	113	33	33	38	28	160	132	94	80	235
27 Jul	292	155	85	24	33	80	212	574	480	988	593	941
28 Jul	494	310	230	61	24	61	334	1,411	729	611	880	978
29 Jul	254	165	132	52	28	113	193	602	536	419	691	597
30 Jul	169	240	33	89	85	56	329	724	517	273	245	273
31 Jul	141	370	313	141	475	456	519	474	442	644	541	809

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Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
1 Jul	122	70	80	94	77	99	80	155	113	56	113	127
2 Jul	85	24	33	85	85	202	287	174	151	118	56	47
3 Jul	19	42	80	75	71	165	122	136	71	19	42	57
4 Jul	118	94	80	122	132	118	179	169	165	127	127	80
5 Jul	42	136	136	99	141	160	75	202	141	61	61	94
6 Jul	99	85	174	141	230	230	183	221	179	132	47	103
7 Jul	212	481	259	200	94	108	80	136	136	122	127	94
8 Jul	76	260	193	203	141	160	99	165	108	103	75	61
9 Jul	122	188	287	146	141	108	179	198	207	89	80	103
10 Jul	122	113	230	202	203	94	216	94	90	99	70	66
11 Jul	113	85	230	245	301	183	245	136	221	592	386	146
12 Jul	423	409	244	207	503	400	273	226	183	386	218	230
13 Jul	113	178	315	235	174	492	545	409	442	423	278	198
14 Jul	532	603	283	537	325	461	413	484	484	301	136	662
15 Jul	2,399	2,709	1,900	1,486	1,613	1,021	1,590	1,308	1,717	2,686	2,150	2,098
16 Jul	1,613	2,201	1,303	1,261	1,099	1,456	2,418	2,620	1,726	1,825	898	1,449
17 Jul	1,820	2,394	1,430	1,237	822	1,214	1,007	644	1,025	1,091	1,223	1,463
18 Jul	1,566	560	1,444	339	1,350	1,021	1,087	579	555	174	414	691
19 Jul	1,174	775	1,054	677	743	851	753	969	720	1,284	1,021	582
20 Jul	1,585	1,505	1,592	1,538	1,265	1,900	1,609	1,740	950	847	1,002	710
21 Jul	1,618	1,590	1,397	1,293	833	933	900	235	508	400	320	212
22 Jul	362	428	560	527	404	433	462	287	325	292	146	245
23 Jul	306	414	263	348	339	367	401	551	353	428	302	688
24 Jul	339	414	626	531	537	349	611	1,074	329	367	636	443
25 Jul	254	301	470	447	496	395	278	386	282	301	315	160
26 Jul	414	66	339	278	382	500	616	611	654	902	580	449
27 Jul	1,881	1,543	945	960	1,242	1,002	1,562	1,270	1,627	720	1,176	1,390
28 Jul	1,261	1,303	1,778	1,477	1,030	720	938	861	2,197	1,439	1,974	1,757
29 Jul	720	696	1,496	1,331	1,359	1,406	1,341	1,912	1,529	1,825	1,420	691
30 Jul	461	593	927	1,016	1,350	985	1,049	645	1,275	1,642	484	484
31 Jul	974	837	278	917	966	1,274	673	1,074	1,218	583	541	236

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Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Aug	108	89	28	9	66	42	146	441	334	461	409	353
2 Aug	386	165	28	66	9	19	103	254	644	447	414	249
3 Aug	301	127	24	42	14	94	146	146	671	861	455	922
4 Aug	132	75	99	24	28	19	259	160	580	359	658	518
5 Aug	287	48	141	153	127	306	325	235	377	362	376	216
6 Aug	47	85	19	14	24	5	118	89	423	216	99	61
7 Aug	94	47	80	28	23	28	66	52	226	89	61	141
8 Aug	66	19	14	47	23	33	19	52	24	24	47	146
9 Aug	66	24	14	0	28	9	52	47	127	99	103	80
10 Aug	47	42	14	42	38	33	75	42	75	118	136	94
11 Aug	94	47	42	56	52	5	47	122	150	127	56	56
12 Aug	89	75	38	38	80	71	89	23	103	61	47	85
13 Aug	38	28	19	38	66	38	47	89	122	38	202	118
Total	13,436	11,227	6,568	4,936	3,909	4,622	7,663	12,083	13,604	13,149	15,567	18,730
% Total	3.3	2.8	1.6	1.2	1.0	1.1	1.9	3.0	3.3	3.2	3.8	4.6
% Cum	3.3	6.0	7.7	8.9	9.8	11.0	12.8	15.8	19.1	22.4	26.2	30.8

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Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
1 Aug	654	574	1,025	423	390	456	611	833	922	1,044	470	489
2 Aug	602	574	569	771	974	753	1,609	1,157	757	767	1,228	484
3 Aug	320	809	734	861	1,110	842	1,242	884	1,350	503	466	245
4 Aug	400	216	301	527	611	386	423	691	494	263	743	118
5 Aug	296	386	588	193	339	151	456	461	409	226	259	169
6 Aug	136	61	221	254	325	212	405	282	160	390	165	80
7 Aug	150	174	127	108	141	240	132	108	99	132	42	99
8 Aug	75	71	108	94	216	239	141	127	151	127	52	113
9 Aug	103	94	131	113	174	348	296	306	320	160	94	122
10 Aug	99	141	282	230	616	306	541	179	183	151	240	174
11 Aug	108	71	122	151	56	132	207	188	174	61	56	47
12 Aug	80	108	132	146	103	155	273	183	127	165	136	28
13 Aug	188	381	400	230	207	66	179	149	127	174	141	151
Total	24,156	24,755	25,167	22,354	23,709	23,089	26,780	25,222	24,952	23,596	20,511	18,136
% Total	5.9	6.1	6.2	5.5	5.8	5.7	6.6	6.2	6.1	5.8	5.0	4.4
% Cum	36.7	42.8	48.9	54.4	60.2	65.9	72.4	78.6	84.7	90.5	95.6	100

Appendix A5.—Daily DIDSON (ten minutes) subsample counts and range from the transducer for the Kenai River, 2009.

Date	North Bank Subsample Counts					South Bank Subsample Counts							
	Number of Fish @ Range					Total	Number of Fish @ Range					Total	
	1	10 m	% Total	10	30 m	% Total	1	10 m	% Total	10	30 m	% Total	
1 Jul	6	2.2	266	97.8	272	263	74.5	90	25.5	353			
2 Jul	26	6.0	408	94.0	434	276	74.4	95	25.6	371			
3 Jul	30	4.6	629	95.4	659	189	75.3	62	24.7	251			
4 Jul	12	1.4	868	98.6	880	353	78.6	96	21.4	449			
5 Jul	30	4.0	721	96.0	751	375	86.8	57	13.2	432			
6 Jul	23	4.0	543	96.0	566	431	84.8	77	15.2	508			
7 Jul	75	8.9	767	91.1	842	530	81.5	120	18.5	650			
8 Jul	82	14.2	497	85.8	579	457	85.7	76	14.3	533			
9 Jul	208	22.5	718	77.5	926	482	87.5	69	12.5	551			
10 Jul	267	37.0	454	63.0	721	480	87.4	69	12.6	549			
11 Jul	399	36.8	684	63.2	1,083	758	91.0	75	9.0	833			
12 Jul	2,101	56.2	1,636	43.8	3,737	1,158	93.0	87	7.0	1,245			
13 Jul	1,042	54.2	882	45.8	1,924	961	89.9	109	10.1	1,070			
14 Jul	2,739	73.6	982	26.4	3,721	1,370	94.0	88	6.0	1,458			
15 Jul	4,573	79.9	1,150	20.1	5,723	6,123	96.9	197	3.1	6,320			
16 Jul	6,145	87.2	898	12.8	7,043	6,506	98.8	79	1.2	6,585			
17 Jul	6,264	89.3	748	10.7	7,012	5,659	98.6	83	1.4	5,742			
18 Jul	3,644	82.3	783	17.7	4,427	4,168	96.5	149	3.5	4,317			
19 Jul	3,400	91.6	312	8.4	3,712	3,161	97.5	80	2.5	3,241			
20 Jul	6,420	93.1	479	6.9	6,899	4,741	98.6	67	1.4	4,808			
21 Jul	2,870	93.5	200	6.5	3,069	3,739	98.2	68	1.8	3,807			
22 Jul	998	87.8	139	12.2	1,137	1,202	95.3	59	4.7	1,261			
23 Jul	1,311	94.5	76	5.5	1,387	1,249	96.3	49	3.7	1,297			
24 Jul	1,877	93.8	124	6.2	2,001	2,068	97.6	50	2.4	2,118			
25 Jul	984	96.2	39	3.8	1,023	1,202	98.0	24	2.0	1,226			
26 Jul	1,535	95.2	77	4.8	1,612	1,473	99.5	7	0.5	1,480			
27 Jul	4,569	99.0	47	1.0	4,616	4,176	99.3	28	0.7	4,204			
28 Jul	4,901	99.0	49	1.0	4,950	4,828	99.4	30	0.6	4,858			
29 Jul	3,663	99.1	34	0.9	3,697	4,117	99.3	30	0.7	4,147			
30 Jul	3,656	99.2	29	0.8	3,685	2,954	99.7	10	0.3	2,964			
31 Jul	3,522	99.5	19	0.5	3,541	3,146	99.4	20	0.6	3,166			
1 Aug	2,377	99.4	15	0.6	2,392	2,204	99.9	3	0.1	2,207			
2 Aug	2,878	99.2	22	0.8	2,900	2,766	99.9	4	0.1	2,770			
3 Aug	2,814	98.9	31	1.1	2,845	2,788	99.6	12	0.4	2,800			
4 Aug	1,619	98.8	20	1.2	1,639	1,704	99.2	14	0.8	1,718			
5 Aug	1,769	98.1	34	1.9	1,803	1,441	98.9	17	1.1	1,458			
6 Aug	1,199	96.0	50	4.0	1,249	796	96.5	29	3.5	825			
7 Aug	699	92.0	61	8.0	760	489	92.4	40	7.6	529			
8 Aug	395	90.2	43	9.8	438	405	94.0	26	6.0	431			
9 Aug	555	90.7	57	9.3	612	598	96.6	21	3.4	619			
10 Aug	714	83.5	141	16.5	855	775	93.5	54	6.5	829			
11 Aug	311	79.1	82	20.9	393	398	84.0	76	16.0	474			
12 Aug	470	87.2	69	12.8	539	475	91.0	47	9.0	522			
13 Aug	652	90.9	65	9.1	717	656	95.3	32	4.7	688			
Total	83,823	84.0	15,948	16.0	99,771	84,089	97.0	2,573	3.0	86,662			

APPENDIX B: KASILOF RIVER DATA

Appendix B1.—Estimated salmon passage along the north bank of the Kaslof River, 2009.

Date	Sockeye		Pink		Chum		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
15 Jun	1,462	1,462	0	0	0	0	0	0	0	0
16 Jun	1,753	3,215	0	0	0	0	0	0	0	0
17 Jun	838	4,053	0	0	0	0	0	0	0	0
18 Jun	879	4,932	0	0	0	0	0	0	0	0
19 Jun	1,587	6,519	0	0	0	0	0	0	0	0
20 Jun	3,326	9,845	0	0	0	0	0	0	0	0
21 Jun	2,189	12,034	0	0	0	0	0	0	0	0
22 Jun	812	12,846	0	0	0	0	0	0	0	0
23 Jun	986	13,832	0	0	0	0	0	0	0	0
24 Jun	2,098	15,930	0	0	0	0	0	0	0	0
25 Jun	3,505	19,435	0	0	0	0	0	0	0	0
26 Jun	2,587	22,022	0	0	0	0	0	0	0	0
27 Jun	5,305	27,327	0	0	0	0	0	0	0	0
28 Jun	776	28,103	0	0	0	0	0	0	0	0
29 Jun	2,247	30,350	0	0	0	0	0	0	0	0
30 Jun	2,183	32,533	0	0	0	0	0	0	0	0
1 Jul	7,356	39,889	0	0	0	0	0	0	0	0
2 Jul	2,976	42,865	0	0	0	0	0	0	0	0
3 Jul	2,530	45,395	0	0	0	0	0	0	0	0
4 Jul	7,707	53,102	0	0	0	0	0	0	0	0
5 Jul	1,906	55,008	0	0	0	0	0	0	0	0
6 Jul	5,664	60,672	0	0	0	0	0	0	0	0
7 Jul	3,753	64,425	0	0	0	0	0	0	0	0
8 Jul	1,345	65,770	0	0	0	0	0	0	0	0
9 Jul	5,059	70,829	349	349	0	0	0	0	0	0
10 Jul	3,345	74,174	167	516	0	0	0	0	0	0
11 Jul	11,736	85,910	1,647	2,163	0	0	0	0	0	0
12 Jul	3,883	89,793	0	2,163	0	0	0	0	0	0
13 Jul	4,060	93,852	306	2,470	0	0	0	0	0	0
14 Jul	9,951	103,803	0	2,470	0	0	0	0	0	0
15 Jul	15,525	119,328	0	2,470	0	0	0	0	0	0
16 Jul	6,502	125,831	418	2,887	0	0	0	0	0	0
17 Jul	5,313	131,144	190	3,077	190	190	0	0	0	0
18 Jul	3,889	135,033	150	3,227	0	190	0	0	0	0
19 Jul	8,478	143,511	0	3,227	0	190	0	0	0	0
20 Jul	4,691	148,202	254	3,480	0	190	0	0	0	0
21 Jul	2,353	150,555	0	3,480	0	190	0	0	0	0
22 Jul	1,043	151,598	241	3,721	0	190	0	0	0	0
23 Jul	1,504	153,102	73	3,794	0	190	0	0	0	0
24 Jul	1,534	154,636	0	3,794	0	190	0	0	0	0
25 Jul	4,420	159,056	0	3,794	0	190	0	0	0	0
26 Jul	10,042	169,098	0	3,794	0	190	0	0	0	0
27 Jul	9,494	178,592	186	3,980	0	190	0	0	0	0
28 Jul	3,366	181,958	0	3,980	0	190	0	0	0	0
29 Jul	4,269	186,227	0	3,980	0	190	0	0	0	0
30 Jul	4,986	191,213	0	3,980	0	190	0	0	0	0
31 Jul	2,682	193,895	0	3,980	0	190	0	0	0	0

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Date	Sockeye		Pink		Chum		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Aug	3,335	197,230	0	3,980	0	190	0	0	0	0
2 Aug	2,871	200,101	0	3,980	0	190	0	0	0	0
3 Aug	2,933	203,034	0	3,980	0	190	0	0	0	0
4 Aug	3,163	206,197	0	3,980	0	190	0	0	0	0
5 Aug	3,015	209,212	0	3,980	0	190	0	0	0	0
6 Aug	2,084	211,296	0	3,980	0	190	0	0	0	0
7 Aug	1,887	213,183	0	3,980	0	190	0	0	0	0
8 Aug	1,703	214,886	0	3,980	0	190	0	0	0	0
9 Aug	1,330	216,216	0	3,980	0	190	0	0	0	0
10 Aug	967	217,183	0	3,980	0	190	0	0	0	0
11 Aug	678	217,861	0	3,980	0	190	0	0	0	0
12 Aug	1,065	218,926	0	3,980	0	190	0	0	0	0
13 Aug	919	219,845	0	3,980	0	190	0	0	0	0
% Total		98.1		1.8		0.1		0.0		0.0
Total		224,015								

Appendix B2.—Estimated salmon passage along the south bank, Kasilof River, 2009.

Date	Sockeye		Pink		Chum		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
15 Jun	842	842	0	0	0	0	0	0	0	0
16 Jun	449	1,291	0	0	0	0	0	0	0	0
17 Jun	126	1,675	0	0	0	0	0	0	0	0
18 Jun	60	4,475	0	0	0	0	0	0	0	0
19 Jun	384	5,721	0	0	0	0	0	0	0	0
20 Jun	2,800	6,420	0	0	0	0	0	0	0	0
21 Jun	1,246	7,629	0	0	0	0	0	0	0	0
22 Jun	699	8,880	0	0	0	0	0	0	0	0
23 Jun	1,209	11,336	0	0	0	0	0	0	0	0
24 Jun	1,251	12,147	0	0	0	0	0	0	0	0
25 Jun	2,456	13,256	0	0	0	0	0	0	0	0
26 Jun	811	14,021	0	0	0	0	0	0	0	0
27 Jun	1,109	15,031	0	0	0	0	0	0	0	0
28 Jun	765	16,576	0	0	0	0	0	0	0	0
29 Jun	1,010	19,178	0	0	0	0	0	0	0	0
30 Jun	1,545	20,459	0	0	0	0	0	0	0	0
1 Jul	2,602	22,573	0	0	0	0	0	0	0	0
2 Jul	1,281	24,504	0	0	0	0	0	0	0	0
3 Jul	2,114	25,291	0	0	0	0	0	0	0	0
4 Jul	1,931	27,633	0	0	0	0	0	0	0	0
5 Jul	787	28,462	0	0	0	0	0	0	0	0
6 Jul	2,342	29,019	0	0	0	0	0	0	0	0
7 Jul	829	29,742	0	0	0	0	0	0	0	0
8 Jul	557	30,514	0	0	0	0	0	0	0	0
9 Jul	723	31,638	50	50	0	0	0	0	0	0
10 Jul	771	32,133	39	89	0	0	0	0	0	0
11 Jul	1,124	32,956	158	247	0	0	0	0	0	0
12 Jul	495	34,121	0	247	0	0	0	0	0	0
13 Jul	823	39,505	62	309	0	0	0	0	0	0
14 Jul	1,165	40,747	0	309	0	0	0	0	0	0
15 Jul	5,384	42,096	0	309	0	0	0	0	0	0
16 Jul	1,242	43,408	80	389	0	0	0	0	0	0
17 Jul	1,349	45,347	48	437	48	48	0	0	0	0
18 Jul	1,313	46,785	50	487	0	48	0	0	0	0
19 Jul	1,939	47,440	0	487	0	48	0	0	0	0
20 Jul	1,438	48,155	78	565	0	48	0	0	0	0
21 Jul	655	48,704	0	565	0	48	0	0	0	0
22 Jul	715	49,280	165	730	0	48	0	0	0	0
23 Jul	548	49,799	27	757	0	48	0	0	0	0
24 Jul	576	50,486	0	757	0	48	0	0	0	0
25 Jul	519	51,781	0	757	0	48	0	0	0	0
26 Jul	687	52,123	0	757	0	48	0	0	0	0
27 Jul	1,296	53,667	25	783	0	48	0	0	0	0
28 Jul	342	55,367	0	783	0	48	0	0	0	0
29 Jul	1,544	57,009	0	783	0	48	0	0	0	0
30 Jul	1,700	57,009	0	783	0	48	0	0	0	0
31 Jul	1,642	57,009	0	783	0	48	0	0	0	0

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Date	Sockeye		Pink		Chum		Coho		Chinook		
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	
1 Aug	1,770	58,779	0	783	0	48	0	0	0	0	
2 Aug	1,832	60,611	0	783	0	48	0	0	0	0	
3 Aug	2,070	62,681	0	783	0	48	0	0	0	0	
4 Aug	2,102	64,783	0	783	0	48	0	0	0	0	
5 Aug	2,128	66,911	0	783	0	48	0	0	0	0	
6 Aug	1,950	68,861	0	783	0	48	0	0	0	0	
7 Aug	1,066	69,927	0	783	0	48	0	0	0	0	
8 Aug	1,610	71,537	0	783	0	48	0	0	0	0	
9 Aug	1,776	73,313	0	783	0	48	0	0	0	0	
10 Aug	1,146	74,459	0	783	0	48	0	0	0	0	
11 Aug	655	75,114	0	783	0	48	0	0	0	0	
12 Aug	999	76,113	0	783	0	48	0	0	0	0	
13 Aug	981	77,094	0	783	0	48	0	0	0	0	
% Total			98.9			1.0			0.0	0.0	
Total			77,925								

Appendix B3.—Kasilof River north bank sonar counts by hour, 2009.

Date	Counts by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
15 Jun	61	61	61	61	61	61	61	61	61	61	61	61
16 Jun	195	128	164	124	82	20	20	12	7	7	0	1
17 Jun	15	22	19	8	19	11	5	3	4	0	10	2
18 Jun	36	41	56	14	31	39	36	47	40	24	25	15
19 Jun	6	20	31	29	34	48	26	10	11	14	27	11
20 Jun	26	51	116	50	158	161	237	132	90	61	76	85
21 Jun	69	31	96	143	182	183	64	80	92	80	120	155
22 Jun	21	26	18	14	88	59	18	43	79	47	34	27
23 Jun	24	11	2	14	42	162	73	22	46	59	38	44
24 Jun	19	21	15	28	25	34	311	147	111	178	101	59
25 Jun	117	155	160	179	196	197	355	594	93	75	216	207
26 Jun	55	39	16	45	34	7	26	13	19	15	9	32
27 Jun	240	167	144	209	273	205	186	163	310	545	238	165
28 Jun	61	70	54	50	56	36	58	25	10	32	18	22
29 Jun	29	41	22	31	31	30	28	49	39	100	102	340
30 Jun	59	23	13	9	15	35	34	33	17	35	47	62
1 Jul	138	60	59	64	115	573	905	756	541	438	316	260
2 Jul	45	34	21	25	38	79	58	100	61	103	94	176
3 Jul	14	22	20	21	10	66	144	150	53	73	59	72
4 Jul	248	157	76	69	63	95	118	195	210	159	234	365
5 Jul	15	20	20	16	27	42	44	58	76	48	55	51
6 Jul	112	82	100	170	170	330	557	808	571	425	178	123
7 Jul	63	60	15	18	64	270	132	132	290	213	138	163
8 Jul	117	80	61	44	92	93	81	50	54	69	66	61
9 Jul	30	43	50	45	102	139	480	569	181	441	482	392
10 Jul	157	54	45	29	43	34	51	283	131	185	331	232
11 Jul	289	241	154	260	291	334	540	801	1,095	540	784	1,564
12 Jul	409	299	184	137	71	90	60	40	380	486	160	354
13 Jul	47	35	16	23	7	12	5	35	109	341	336	290
14 Jul	83	76	78	61	36	22	11	36	54	216	512	604
15 Jul	708	277	137	72	215	296	319	549	811	355	1,055	1,016

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Date	Counts by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
15 Jun	61	61	58	23	92	82	54	32	46	66	30	126
16 Jun	7	61	29	119	27	24	20	87	412	197	3	7
17 Jun	36	38	161	99	75	96	105	40	24	16	19	11
18 Jun	33	40	30	68	69	57	91	42	9	7	27	2
19 Jun	13	35	18	193	267	132	204	149	110	103	59	37
20 Jun	140	111	96	147	479	235	228	240	142	151	64	50
21 Jun	66	41	28	72	59	211	84	113	106	54	42	18
22 Jun	54	12	11	12	11	12	12	13	24	96	36	45
23 Jun	23	14	11	5	20	17	12	23	45	101	103	75
24 Jun	55	26	52	46	31	29	49	56	105	147	242	211
25 Jun	58	30	56	40	36	50	56	134	184	109	121	87
26 Jun	74	77	56	64	77	101	95	148	263	427	470	425
27 Jun	256	113	44	36	46	61	80	231	342	585	374	292
28 Jun	30	33	26	13	33	33	20	8	11	16	18	43
29 Jun	241	105	69	125	127	78	86	113	120	85	118	138
30 Jun	117	97	54	101	145	170	95	86	100	153	300	383
1 Jul	192	509	732	445	443	326	87	101	91	86	52	67
2 Jul	165	216	347	590	159	175	170	135	95	37	12	41
3 Jul	111	45	47	140	240	178	223	223	218	100	122	179
4 Jul	529	733	725	717	638	938	499	317	230	198	123	71
5 Jul	42	85	63	59	80	85	145	76	110	303	219	167
6 Jul	150	195	204	152	244	242	294	159	79	98	103	118
7 Jul	136	105	112	106	156	210	271	303	102	196	294	204
8 Jul	44	20	45	38	32	32	34	30	51	49	57	45
9 Jul	267	332	303	242	178	200	148	138	136	104	190	216
10 Jul	129	100	152	95	89	77	82	149	147	240	235	442
11 Jul	963	329	280	477	671	573	530	181	906	879	329	372
12 Jul	246	189	158	90	60	97	66	42	48	65	117	35
13 Jul	560	418	313	184	273	209	280	160	135	138	269	171
14 Jul	340	575	446	390	265	361	285	507	793	865	1,914	1,421
15 Jul	1,086	1,564	1,286	1,897	882	791	557	445	364	409	242	192

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Date	Counts by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
16 Jul	106	37	56	69	109	282	258	546	471	274	428	464
17 Jul	47	45	41	105	94	63	25	52	67	92	246	272
18 Jul	77	100	53	46	36	92	95	120	164	106	54	78
19 Jul	95	200	229	504	435	457	631	528	337	278	452	460
20 Jul	48	38	75	258	421	243	307	317	316	194	268	181
21 Jul	21	9	15	24	97	145	170	80	114	144	65	92
22 Jul	51	44	44	40	66	67	104	67	36	54	49	47
23 Jul	11	52	5	17	4	33	134	141	79	73	178	96
24 Jul	20	1	2	4	3	4	1	95	108	110	159	109
25 Jul	74	61	39	49	62	64	87	104	535	248	166	179
26 Jul	129	114	110	126	159	167	211	225	266	866	917	353
27 Jul	226	173	149	149	172	385	440	303	337	459	896	852
28 Jul	55	52	30	39	83	67	63	70	134	62	104	111
29 Jul	71	83	48	88	59	118	191	256	122	145	184	237
30 Jul	45	47	44	63	96	268	338	360	426	221	201	202
31 Jul	32	39	24	41	75	86	115	136	110	176	113	113
1 Aug	15	10	20	37	20	74	130	177	151	217	137	125
2 Aug	52	4	12	6	18	40	98	178	172	164	154	167
3 Aug	64	21	28	16	60	79	197	238	222	167	170	180
4 Aug	51	17	14	19	12	65	128	164	151	188	204	194
5 Aug	107	39	38	38	42	111	315	431	169	182	170	201
6 Aug	46	19	21	21	14	17	73	298	168	100	110	171
7 Aug	27	75	191	145	11	13	85	82	87	106	62	56
8 Aug	48	15	11	10	17	27	49	96	96	123	116	84
9 Aug	25	23	32	14	14	24	96	66	66	68	67	81
10 Aug	24	9	10	11	7	9	39	67	72	66	73	92
11 Aug	6	2	4	1	11	10	22	31	25	17	18	67
12 Aug	25	15	6	15	7	20	84	79	72	35	47	37
13 Aug	26	17	14	7	5	30	95	44	37	34	79	32
Total	5,132	3,808	3,388	4,024	4,880	6,823	9,624	11,347	10,756	10,394	11,809	12,344
% Total	2.3	1.7	1.5	1.8	2.2	3.0	4.3	5.1	4.8	4.6	5.3	5.5
% Cum	2.3	4.0	5.5	7.3	9.5	12.5	16.8	21.9	26.7	31.3	36.6	42.1

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Date	Counts by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
16 Jul	209	616	499	610	437	471	253	232	163	127	155	48
17 Jul	333	320	510	633	724	434	312	338	233	218	297	192
18 Jul	119	107	126	236	450	346	308	302	413	274	197	140
19 Jul	441	346	276	240	376	638	308	299	375	284	167	122
20 Jul	250	165	253	277	246	402	139	71	183	153	92	48
21 Jul	75	82	94	58	114	134	102	102	133	201	176	106
22 Jul	50	37	63	47	33	59	56	58	51	70	67	24
23 Jul	167	52	41	41	59	52	43	95	55	50	46	53
24 Jul	113	92	78	40	67	66	70	87	135	70	41	59
25 Jul	240	305	296	224	161	202	218	143	440	243	136	144
26 Jul	447	606	394	355	427	281	640	628	482	1,103	664	372
27 Jul	657	546	599	432	524	387	335	410	317	202	543	187
28 Jul	320	332	280	354	225	228	153	112	122	132	94	144
29 Jul	188	253	308	255	230	267	222	253	235	178	211	67
30 Jul	218	302	336	267	301	327	291	198	154	141	80	60
31 Jul	97	112	119	126	168	151	225	192	138	154	80	60
1 Aug	162	183	171	198	222	249	267	279	212	139	104	36
2 Aug	146	117	95	91	103	111	187	222	236	264	182	52
3 Aug	183	196	121	154	93	133	154	139	114	109	73	22
4 Aug	133	195	180	144	166	94	151	153	176	256	210	98
5 Aug	140	125	163	114	116	50	78	108	101	76	71	30
6 Aug	102	120	88	199	120	78	76	36	68	63	59	17
7 Aug	92	70	122	36	85	64	72	69	92	157	66	22
8 Aug	58	96	66	53	84	91	84	76	115	79	105	104
9 Aug	67	29	127	36	47	73	89	56	67	90	54	19
10 Aug	59	54	36	38	55	39	34	47	30	52	31	13
11 Aug	29	30	39	51	66	45	41	37	26	28	49	23
12 Aug	51	68	82	64	58	64	31	27	54	37	57	30
13 Aug	21	52	74	63	33	43	47	23	39	35	44	25
Total	11,391	11,917	11,648	12,221	11,794	11,461	9,948	9,273	10,507	11,065	10,455	8,008
% Total	5.1	5.3	5.2	5.5	5.3	5.1	4.4	4.1	4.7	4.9	4.7	3.6
% Cum	47.2	52.5	57.7	63.2	68.4	73.5	78.0	82.1	86.8	91.8	96.4	100

Appendix B4.—Kasilof River south bank sonar counts by hour, 2009.

Date	Counts by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
15 Jun	35	35	35	35	35	35	35	35	35	35	35	35
16 Jun	53	57	55	72	40	26	7	18	32	33	9	17
17 Jun	1	0	1	7	6	2	3	1	0	2	88	0
18 Jun	0	0	0	0	6	8	1	3	3	10	5	3
19 Jun	0	2	0	1	5	0	0	5	3	9	3	13
20 Jun	18	110	283	229	304	159	399	310	112	142	124	105
21 Jun	16	15	51	146	94	45	49	46	27	36	47	41
22 Jun	30	40	30	38	58	40	26	36	57	23	59	29
23 Jun	25	13	22	20	58	240	145	69	59	93	32	33
24 Jun	39	32	29	42	37	46	140	126	61	80	78	46
25 Jun	201	153	189	204	229	227	289	250	162	67	54	27
26 Jun	43	41	20	16	6	11	20	13	35	59	38	45
27 Jun	71	22	54	42	37	15	32	50	27	60	31	14
28 Jun	99	78	47	44	6	25	10	19	51	30	42	34
29 Jun	29	34	21	41	90	18	23	27	21	123	63	89
30 Jun	66	38	19	12	16	26	16	12	5	12	35	21
1 Jul	165	66	51	123	171	420	368	351	184	119	37	26
2 Jul	12	21	19	32	30	29	56	52	49	85	72	48
3 Jul	25	23	20	19	33	60	209	133	170	82	65	48
4 Jul	86	24	56	78	40	24	18	44	91	198	552	210
5 Jul	20	12	20	10	10	5	13	23	16	41	26	22
6 Jul	62	73	58	114	239	335	228	104	129	40	73	29
7 Jul	22	11	10	8	42	118	75	30	31	36	16	16
8 Jul	25	9	6	2	19	13	25	8	214	2	12	2
9 Jul	9	7	9	9	8	17	16	26	42	19	9	5
10 Jul	8	8	13	4	10	4	4	11	16	14	7	19
11 Jul	9	10	10	17	10	23	7	10	63	111	57	55
12 Jul	17	0	3	19	5	10	7	11	14	33	24	15
13 Jul	11	3	3	0	1	16	3	17	34	107	94	86
14 Jul	15	13	18	15	10	15	20	25	31	38	57	49
15 Jul	388	213	78	241	238	244	190	126	178	835	317	165

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Date	Counts by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
15 Jun	35	35	48	41	20	16	48	19	20	48	53	38
16 Jun	0	1	7	3	4	5	1	3	0	2	2	2
17 Jun	3	1	0	1	0	0	0	10	0	0	0	0
18 Jun	3	2	4	1	1	1	6	0	1	1	0	1
19 Jun	1	2	0	1	0	1	0	14	0	0	184	140
20 Jun	71	35	31	61	88	72	39	22	62	11	3	10
21 Jun	28	34	8	16	20	41	73	63	197	59	55	39
22 Jun	27	22	11	8	3	8	15	6	30	44	30	29
23 Jun	25	37	31	20	15	11	11	37	30	59	58	66
24 Jun	31	60	39	58	18	31	24	12	41	39	71	71
25 Jun	29	14	37	12	32	35	31	69	42	42	35	26
26 Jun	61	53	48	26	33	30	42	23	80	30	20	18
27 Jun	35	11	11	7	31	9	44	22	97	191	107	89
28 Jun	35	44	22	20	12	6	18	44	20	18	26	15
29 Jun	44	21	78	8	19	10	48	57	9	15	34	88
30 Jun	77	64	30	53	38	52	36	42	32	249	181	413
1 Jul	62	37	12	58	32	8	75	57	95	39	46	0
2 Jul	22	34	70	139	182	48	74	93	34	17	36	27
3 Jul	63	86	84	179	135	122	83	140	147	53	64	71
4 Jul	106	53	55	53	32	51	22	35	3	33	48	19
5 Jul	25	49	54	69	41	39	44	42	94	8	41	63
6 Jul	34	30	78	92	73	68	65	161	130	38	45	44
7 Jul	50	37	20	21	13	33	32	45	43	46	61	13
8 Jul	14	10	9	86	9	8	9	7	13	10	19	26
9 Jul	17	16	41	22	41	33	26	34	195	106	56	10
10 Jul	7	37	41	15	88	64	22	54	163	174	24	3
11 Jul	27	20	13	67	36	12	72	347	278	12	6	10
12 Jul	38	90	43	14	14	20	15	17	23	21	26	16
13 Jul	40	143	24	9	15	30	102	31	14	11	88	3
14 Jul	49	84	92	27	47	31	54	137	124	45	53	116
15 Jul	490	307	434	383	199	77	77	49	57	23	42	33

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Date	Counts by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
16 Jul	31	21	33	33	40	57	49	48	57	89	60	63
17 Jul	27	46	18	20	44	27	10	42	26	61	72	110
18 Jul	45	22	30	26	13	74	34	70	54	52	56	31
19 Jul	52	60	62	81	131	89	78	73	115	118	191	92
20 Jul	47	30	45	78	99	65	41	59	119	97	77	46
21 Jul	23	15	14	6	38	32	15	19	80	63	26	24
22 Jul	18	22	10	18	37	94	114	77	24	36	36	36
23 Jul	31	14	28	10	19	17	31	27	21	29	32	45
24 Jul	17	15	10	14	11	29	12	13	4	22	64	29
25 Jul	17	18	16	6	11	18	6	10	36	18	25	49
26 Jul	17	30	38	24	16	26	15	9	22	14	15	15
27 Jul	74	105	105	61	41	40	71	35	33	48	67	122
28 Jul	14	9	15	11	22	19	13	9	1	5	8	6
29 Jul	74	75	71	42	31	33	40	41	49	37	26	5
30 Jul	28	44	37	45	124	147	100	289	183	94	61	57
31 Jul	13	11	16	5	16	24	36	47	40	37	69	69
1 Aug	16	15	15	16	19	37	118	228	209	144	128	82
2 Aug	20	11	18	8	10	37	59	78	35	227	96	79
3 Aug	20	25	12	13	12	56	168	87	136	146	73	106
4 Aug	18	15	21	77	32	33	98	144	142	77	75	95
5 Aug	44	31	26	27	18	90	208	295	196	139	102	95
6 Aug	18	43	6	14	12	73	106	192	200	138	139	96
7 Aug	23	11	15	9	1	11	48	61	89	119	57	88
8 Aug	58	25	26	11	18	47	100	101	94	142	61	81
9 Aug	20	25	17	26	23	76	158	114	153	138	101	68
10 Aug	22	19	25	12	9	51	72	78	117	115	104	83
11 Aug	41	14	5	13	12	26	27	45	26	18	11	30
12 Aug	13	21	12	12	14	14	73	97	49	36	30	57
13 Aug	19	9	7	4	8	14	20	55	100	81	69	43
Total	2,460	1,964	1,983	2,362	2,774	3,612	4,354	4,434	4,362	4,914	4,092	3,149
% Total	3.1	2.5	2.5	3.0	3.6	4.6	5.6	5.7	5.6	6.3	5.2	4.0
% Cum	3.1	5.7	8.2	11.2	14.8	19.4	25.0	30.7	36.2	42.5	47.8	51.8

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Date	Counts by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
16 Jul	78	143	145	63	55	34	48	62	23	55	17	18
17 Jul	41	60	103	198	143	108	95	76	38	23	17	40
18 Jul	44	45	92	106	58	115	84	118	85	71	34	4
19 Jul	139	75	93	58	39	99	95	38	59	53	30	19
20 Jul	60	66	121	56	42	16	61	46	50	51	72	72
21 Jul	21	20	15	15	13	16	50	11	15	28	59	37
22 Jul	36	24	19	24	24	20	32	34	26	42	35	42
23 Jul	26	16	16	54	33	6	13	39	20	5	13	30
24 Jul	25	34	17	13	24	56	33	45	40	26	9	14
25 Jul	38	47	40	13	21	34	26	6	31	24	2	7
26 Jul	18	10	19	113	19	18	37	31	25	42	49	65
27 Jul	115	67	62	32	49	50	30	40	15	26	13	20
28 Jul	8	8	11	15	10	32	24	18	16	12	26	30
29 Jul	12	105	117	138	199	153	114	72	36	28	13	33
30 Jul	20	22	35	42	128	59	44	33	43	20	27	18
31 Jul	69	69	69	227	208	130	146	132	84	53	38	34
1 Aug	53	48	69	126	48	81	75	38	85	44	50	26
2 Aug	57	85	162	91	42	17	47	78	84	233	228	30
3 Aug	23	83	179	337	228	79	55	33	49	61	68	21
4 Aug	115	108	108	44	66	62	62	182	144	149	176	59
5 Aug	97	47	85	67	48	42	39	111	104	96	88	33
6 Aug	88	159	38	55	143	76	31	62	112	66	47	36
7 Aug	41	59	37	35	30	36	26	30	73	90	47	30
8 Aug	73	60	68	71	36	39	49	102	75	115	120	38
9 Aug	68	85	43	69	82	60	130	46	65	73	81	55
10 Aug	48	46	48	49	31	14	34	57	36	30	29	17
11 Aug	23	27	31	33	37	29	38	38	29	41	36	25
12 Aug	66	49	68	66	46	41	55	39	56	51	21	13
13 Aug	51	35	68	66	57	59	37	44	54	19	40	22
Total	3,102	3,171	3,453	3,846	3,250	2,553	2,818	3,353	3,646	3,071	2,999	2,387
% Total	4.0	4.1	4.4	4.9	4.2	3.3	3.6	4.3	4.7	3.9	3.8	3.1
% Cum	55.8	59.8	64.3	69.2	73.3	76.6	80.2	84.5	89.2	93.1	96.9	100

Appendix B5.—Kasilof River north bank sonar counts by sector, 2009.

Date	Counts by Sector											
	1	2	3	4	5	6	7	8	9	10	11	12
15 Jun	58	19	18	66	154	190	172	184	143	146	199	113
16 Jun	678	258	169	125	179	90	49	46	26	19	105	9
17 Jun	194	50	42	93	167	122	64	44	32	20	10	0
18 Jun	129	45	32	80	169	191	52	66	62	25	22	6
19 Jun	137	64	168	147	197	379	172	45	165	41	55	17
20 Jun	194	183	525	358	410	697	471	83	219	79	73	34
21 Jun	195	163	347	211	250	439	244	78	165	46	34	17
22 Jun	34	47	94	99	129	209	94	38	40	13	11	4
23 Jun	60	38	173	107	156	249	120	22	31	18	8	4
24 Jun	162	59	523	370	240	416	198	36	57	21	9	7
25 Jun	128	226	1,033	613	413	623	337	49	50	17	12	4
26 Jun	63	373	686	459	272	436	171	56	27	22	11	11
27 Jun	108	756	1,445	960	650	812	322	112	63	15	20	42
28 Jun	46	86	62	116	90	182	78	49	35	12	12	8
29 Jun	57	131	510	478	343	491	113	67	26	16	13	2
30 Jun	134	119	250	330	333	578	163	164	48	21	32	11
1 Jul	383	1,003	2,267	1,146	755	1,101	329	147	122	36	36	31
2 Jul	40	105	589	387	362	895	226	121	141	53	41	16
3 Jul	56	120	319	273	273	775	270	75	181	74	77	37
4 Jul	289	1,164	1,610	1,132	817	1,502	669	89	241	94	60	40
5 Jul	181	223	260	294	191	413	123	47	77	33	35	29
6 Jul	1,029	1,810	965	636	268	562	128	61	76	23	35	71
7 Jul	577	795	537	356	202	538	216	60	287	59	96	30
8 Jul	216	162	176	120	56	166	102	26	221	49	12	39
9 Jul	1,013	2,682	925	249	68	260	95	19	48	16	25	8
10 Jul	545	1,635	465	235	83	154	99	29	194	33	13	27
11 Jul	1,978	7,988	1,192	459	194	543	461	64	328	83	41	52
12 Jul	297	2,567	298	254	93	126	158	16	39	21	4	10
13 Jul	642	3,062	274	185	68	46	46	16	17	7	1	2
14 Jul	2,597	6,508	434	205	51	43	70	17	13	4	3	6
15 Jul	2,928	9,032	2,086	442	234	320	208	75	60	66	57	17

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Date	Counts by Sector											
	1	2	3	4	5	6	7	8	9	10	11	12
16 Jul	355	4,991	929	227	130	156	25	29	22	13	37	6
17 Jul	779	3,108	898	179	133	220	85	34	56	47	85	69
18 Jul	215	1,979	1,210	174	196	44	87	22	12	9	10	81
19 Jul	209	4,778	2,786	186	276	39	93	43	27	12	10	19
20 Jul	176	2,731	1,537	129	131	56	65	46	22	26	9	17
21 Jul	227	767	443	161	142	145	161	93	80	74	40	20
22 Jul	127	223	78	158	102	92	106	85	103	113	66	31
23 Jul	56	1,134	169	57	11	13	79	21	8	8	2	19
24 Jul	20	21	38	531	640	138	43	35	20	20	3	25
25 Jul	60	54	193	1,542	1,838	461	131	82	34	12	9	4
26 Jul	48	136	676	4,358	3,561	762	303	105	70	15	6	2
27 Jul	74	159	736	4,161	3,280	753	307	113	63	25	7	2
28 Jul	78	107	636	1,610	596	153	54	44	44	12	12	20
29 Jul	47	156	850	2,154	722	153	76	32	35	14	13	17
30 Jul	69	201	944	2,325	986	230	113	50	23	17	12	16
31 Jul	119	271	792	728	331	113	55	49	60	48	73	43
1 Aug	283	336	955	1,043	459	150	50	25	15	12	4	3
2 Aug	468	337	1,033	585	283	82	23	18	31	7	4	0
3 Aug	627	387	1,036	448	291	75	24	17	14	9	3	2
4 Aug	568	389	1,149	562	344	85	28	19	8	3	5	3
5 Aug	243	361	1,242	597	393	112	35	12	12	4	3	1
6 Aug	272	354	802	317	240	43	10	10	16	10	9	1
7 Aug	275	220	544	292	321	56	13	16	67	39	39	5
8 Aug	310	211	463	316	188	80	21	11	15	20	5	63
9 Aug	184	143	293	399	126	107	19	11	20	8	0	20
10 Aug	160	88	197	283	79	95	27	10	8	7	4	9
11 Aug	187	44	139	155	40	45	13	12	16	5	6	16
12 Aug	143	97	272	290	96	78	22	19	14	2	1	31
13 Aug	64	109	255	264	77	88	17	11	13	9	4	8
Total	21,591	65,365	39,769	35,216	23,879	18,172	8,105	3,075	4,162	1,782	1,643	1,257
% Total	9.6	29.2	17.8	15.7	10.7	8.1	3.6	1.4	1.9	0.8	0.7	0.6
% Cum	9.6	38.8	56.6	72.3	82.9	91.1	94.7	96.1	97.9	98.7	99.4	100

Appendix B6.—Kasilof River south bank sonar counts by sector, 2009.

Date	Counts by Sector											
	1	2	3	4	5	6	7	8	9	10	11	12
15 Jun	8	0	0	24	49	78	62	93	134	179	118	97
16 Jun	10	7	23	35	72	44	33	35	37	42	24	87
17 Jun	28	9	8	8	9	8	10	12	10	8	6	10
18 Jun	10	0	0	0	0	0	1	3	4	5	13	24
19 Jun	40	0	0	4	69	97	9	115	15	10	3	22
20 Jun	35	97	305	522	573	333	153	147	96	299	209	31
21 Jun	14	18	79	165	225	106	88	130	40	221	128	32
22 Jun	8	34	46	94	141	46	40	132	29	93	19	17
23 Jun	10	36	111	232	273	91	82	145	28	113	43	45
24 Jun	13	56	148	266	221	126	55	134	31	129	43	29
25 Jun	179	200	240	342	306	671	65	141	77	81	89	65
26 Jun	11	23	72	118	152	87	42	132	44	28	85	17
27 Jun	24	13	109	183	206	192	74	139	22	24	70	53
28 Jun	1	19	103	188	106	56	35	72	22	44	75	44
29 Jun	28	48	110	238	144	112	59	153	20	28	43	27
30 Jun	22	66	327	270	328	216	55	110	22	32	70	27
1 Jul	121	330	769	516	342	180	51	137	15	59	64	18
2 Jul	27	14	104	289	305	142	37	108	29	103	79	44
3 Jul	20	50	206	480	508	273	53	147	30	151	123	73
4 Jul	37	81	191	406	432	191	66	131	42	187	109	58
5 Jul	41	64	61	173	112	102	54	53	31	18	38	40
6 Jul	224	651	461	285	207	99	43	98	63	64	100	47
7 Jul	59	132	151	131	135	81	19	36	27	24	22	12
8 Jul	78	26	36	107	37	23	7	8	6	5	20	12
9 Jul	19	359	90	63	77	31	8	25	11	30	34	26
10 Jul	10	330	104	122	90	42	13	23	3	37	19	17
11 Jul	28	414	250	163	150	35	24	50	7	42	61	58
12 Jul	5	80	57	59	112	13	31	30	7	43	42	16
13 Jul	19	183	131	160	164	39	37	49	4	48	24	27
14 Jul	137	215	220	172	152	69	38	50	45	24	22	21
15 Jul	1,918	1,624	764	351	255	186	91	97	39	29	14	16

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Date	Counts by Sector											
	1	2	3	4	5	6	7	8	9	10	11	12
16 Jul	265	469	322	128	50	11	22	23	5	14	2	11
17 Jul	228	536	300	183	84	35	22	23	12	10	3	9
18 Jul	273	521	234	110	37	24	17	38	50	29	24	6
19 Jul	478	708	348	176	70	50	18	35	23	10	20	3
20 Jul	267	627	235	75	50	39	8	33	16	9	147	10
21 Jul	141	180	138	73	42	39	14	3	5	3	10	7
22 Jul	117	117	134	149	101	101	24	19	23	36	28	31
23 Jul	125	88	106	71	34	34	22	26	29	14	16	10
24 Jul	100	49	65	95	48	49	14	21	71	33	18	13
25 Jul	32	11	66	102	102	100	53	13	8	2	10	20
26 Jul	22	45	198	137	120	81	53	3	9	7	6	6
27 Jul	66	111	292	332	219	164	81	16	14	18	4	4
28 Jul	49	42	87	49	37	33	22	7	1	3	5	7
29 Jul	193	313	577	210	67	81	43	22	15	13	5	5
30 Jul	357	401	503	197	53	53	65	32	18	10	6	5
31 Jul	269	315	242	169	371	186	39	20	13	7	2	9
1 Aug	224	300	128	123	527	246	92	44	17	18	20	31
2 Aug	191	401	288	149	281	247	87	67	50	12	27	32
3 Aug	59	98	350	230	698	320	85	105	81	8	7	29
4 Aug	107	114	107	145	923	442	91	51	26	19	49	28
5 Aug	36	65	152	184	1,097	376	72	35	70	12	27	2
6 Aug	95	68	161	457	869	196	44	9	2	6	24	19
7 Aug	25	22	64	275	566	84	18	7	0	0	1	4
8 Aug	67	58	117	398	795	104	28	13	4	3	13	10
9 Aug	81	42	92	239	912	297	47	20	10	2	17	17
10 Aug	56	26	100	94	560	238	34	12	9	3	6	8
11 Aug	86	79	103	34	225	76	19	19	5	1	3	5
12 Aug	146	31	189	66	409	115	24	9	7	2	1	0
13 Aug	162	60	197	93	374	68	14	8	3	1	1	0
Total	7,501	11,076	11,171	10,909	15,673	7,658	2,607	3,468	1,586	2,505	2,311	1,453
% Total	9.6	14.2	14.3	14.0	20.1	9.8	3.3	4.5	2.0	3.2	3.0	1.9
% Cum	9.6	23.8	38.2	52.2	72.3	82.1	85.5	89.9	92.0	95.2	98.1	100

Appendix B7.-Minimum and maximum daily counting ranges for both banks of the Kasilof River, 2009.

Date	North Bank			South Bank			Sectors where >80% of counts occurred
	Counting Range (ft)	Range where >80% of counts occurred (m)	Sectors where >80% of counts occurred	Counting Range (ft)	Range where >80% of counts occurred (m)	Sectors where >80% of counts occurred	
15 Jun	40	12.2	11.2	35	10.7	9.8	1 11
16 Jun	40	12.2	5.1	35	10.7	9.8	1 11
16 Jun	41	12.5	5.2	35	11.0	10.1	1 11
17 Jun	41	12.5	6.2	36	11.0	8.2	1 9
18 Jun	41	12.5	8.3	36	11.0	11.0	1 12
18 Jun	35	10.7	7.1	36	11.0	7.3	1 8
19 Jun	35	10.7	6.2	36	11.0	8.2	1 9
19 Jun	34	10.4	6.0	36	11.0	8.0	1 9
20 Jun	34	10.4	6.0	35	10.7	8.9	1 10
20 Jun	35	10.7	6.2	35	10.7	8.0	1 9
21 Jun	35	10.7	6.2	35	10.7	7.1	1 8
22 Jun	35	10.7	6.2	35	10.7	7.1	1 8
23 Jun	35	10.7	6.2	35	10.7	7.1	1 8
24 Jun	35	10.7	5.3	35	10.7	7.1	1 8
25 Jun	35	10.7	5.3	35	10.7	6.2	1 7
26 Jun	35	10.7	5.3	35	10.7	8.0	1 9
27 Jun	35	10.7	5.3	35	10.7	7.1	1 8
28 Jun	35	10.7	8.9	35	10.7	8.9	1 10
29 Jun	35	10.7	5.3	35	10.7	7.1	1 8
30 Jun	35	10.7	5.3	35	10.7	5.3	1 6
1 Jul	35	10.7	5.3	35	10.7	4.4	1 5
1 Jul	34	10.4	5.2	35	10.7	7.1	1 8
2 Jul	34	10.4	5.2	35	10.7	7.1	1 8
2 Jul	35	10.7	5.3	35	10.7	7.1	1 8
3 Jul	34	10.4	6.0	35	10.7	7.1	1 8
4 Jul	34	10.4	5.2	35	10.7	8.0	1 9
5 Jul	34	10.4	5.2	35	10.7	7.1	1 8
6 Jul	34	10.4	4.3	35	10.7	5.3	1 6
7 Jul	34	10.4	5.2	35	10.7	5.3	1 6
8 Jul	34	10.4	7.8	35	10.7	10.7	1 12
9 Jul	34	10.4	2.6	35	10.7	5.3	1 6
10 Jul	34	10.4	3.5	35	10.7	4.4	1 5
11 Jul				35	10.7	5.3	1 6
11 Jul	34	10.4	2.6	34	10.4	5.2	1 6
12 Jul	34	10.4	2.6	34	10.4	7.8	1 9
13 Jul	34	10.4	1.7	34	10.4	6.0	1 7
14 Jul	34	10.4	1.7	34	10.4	5.2	1 6
14 Jul				38	11.6	5.8	1 6
15 Jul	34	10.4	2.6	38	11.6	2.9	1 3
15 Jul	42	12.8	3.2	36	11.0	2.7	1 3
16 Jul	42	12.8	3.2	36	11.0	2.7	1 3
16 Jul	42	12.8	3.2	36	11.0	3.7	1 4
17 Jul	42	12.8	3.2	36	11.0	3.7	1 4
17 Jul	36	11.0	2.7	34	10.4	3.5	1 4
18 Jul	36	11.0	2.7	34	10.4	3.5	1 4
18 Jul	36	11.0	2.7	34	10.4	4.3	1 5
19 Jul	36	11.0	2.7	34	10.4	4.1	1 4
20 Jul	36	11.0	2.7	34	10.4	4.1	1 4

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Date	North Bank			South Bank			Sectors where >80% of counts occurred	
	Counting Range (ft)	(m)	Range where >80% of counts occurred (m)	Counting Range (ft)	(m)	Range where >80% of counts occurred (m)		
21 Jul	36	11.0	5.5	1 6	34	10.4	3.5	1 4
21 Jul	11	3.4	1.7	1 6				
22 Jul	11	3.4	2.5	1 9	34	10.4	5.2	1 6
22 Jul	25	7.6	5.7	1 9	24	7.3	3.7	1 6
23 Jul	25	7.6	1.9	1 3	25	7.6	3.8	1 6
23 Jul				24	7.3	3.7	1 6	
24 Jul	25	7.6	3.2	1 5	24	7.3	5.5	1 9
24 Jul	13	4.0	1.7	1 5	15	4.6	3.4	1 9
25 Jul	13			15	4.6	2.3	1 6	
25 Jul	14	4.3	1.8	1 5				
26 Jul	14	4.3	1.8	1 5	15	4.6	2.3	1 6
27 Jul	14	4.3	1.8	1 5	15	4.6	2.3	1 6
28 Jul	14	4.3	1.8	1 5	15	4.6	2.3	1 6
29 Jul	14	4.3	1.8	1 5	18	5.5	1.8	1 4
29 Jul	14	4.3	1.8	1 5				
30 Jul	14	4.3	1.8	1 5	18	5.5	1.8	1 4
31 Jul	14	4.3	1.8	1 5	18	5.5	2.3	1 5
31 Jul				12	3.7	1.5	1 5	
1 Aug	14	4.3	1.8	1 5	12	3.7	1.8	1 6
1 Aug				11	3.4	1.7	1 6	
2 Aug	14	4.3	1.4	1 4	11	3.4	1.7	1 6
3 Aug	14	4.3	1.4	1 4	11	3.4	1.7	1 6
4 Aug	14	4.3	1.4	1 4	11	3.4	1.7	1 6
5 Aug	14	4.3	1.4	1 4	11	3.4	1.7	1 6
6 Aug	14	4.3	1.4	1 4	11	3.4	1.4	1 5
6 Aug				12	3.7	1.5	1 5	
7 Aug	14	4.3	1.8	1 5	12	3.7	1.5	1 5
8 Aug	14	4.3	1.8	1 5	12	3.7	1.5	1 5
9 Aug	14	4.3	1.8	1 5	11	3.4	1.7	1 6
10 Aug	14	4.3	1.8	1 5	11	3.4	1.7	1 6
11 Aug	14	4.3	1.8	1 5	11	3.4	1.4	1 5
12 Aug	14	4.3	1.8	1 5	11	3.4	1.4	1 5
13 Aug	14	4.3	1.8	1 5	11	3.4	1.4	1 5
Average		8.6	3.8	1 6	Average	8.3	4.8	1 7
min		3.4	1.4		min	3.4	1.4	
max		12.8	11.2		max	12.2	11.0	
Std Dev		3.3	2.2		Std Dev	3.2	2.8	

APPENDIX C: YENTNA RIVER DATA

Appendix C1.—Estimated salmon passage ranges adjacent to the north bank of the Yentna River, 2009.

Date	Sockeye				Pink			
	Daily		Cum		Daily		Cum	
	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	22	76	22	76	32	86	32	86
8 Jul	74	161	96	237	25	112	57	198
9 Jul	90	191	186	428	40	180	98	378
10 Jul	106	263	292	690	55	212	153	590
11 Jul	140	427	432	1,117	165	512	318	1,103
12 Jul	83	362	515	1,479	313	681	631	1,784
13 Jul	103	485	618	1,964	621	1,258	1,252	3,042
14 Jul	98	574	716	2,538	1,145	1,849	2,397	4,891
15 Jul	54	341	770	2,880	1,165	1,735	3,562	6,626
16 Jul	194	1,127	964	4,007	2,485	4,064	6,047	10,690
17 Jul	120	650	1,084	4,656	1,472	2,588	7,519	13,278
18 Jul	84	635	1,168	5,291	5,022	6,290	12,541	19,568
19 Jul	27	225	1,195	5,516	4,990	5,782	17,531	25,350
20 Jul	39	297	1,235	5,814	4,810	6,018	22,340	31,367
21 Jul	62	450	1,297	6,264	6,161	8,039	28,501	39,406
22 Jul	121	843	1,418	7,106	6,600	9,003	35,101	48,410
23 Jul	133	848	1,551	7,955	4,856	7,241	39,957	55,651
24 Jul	109	698	1,660	8,652	9,316	13,813	49,273	69,463
25 Jul	96	611	1,756	9,263	8,893	13,331	58,166	82,794
26 Jul	66	400	1,822	9,663	5,924	9,212	64,091	92,006
27 Jul	44	293	1,866	9,956	6,210	8,799	70,301	100,805
28 Jul	150	855	2,015	10,812	8,318	13,828	78,619	114,633
29 Jul	445	2,460	2,461	13,272	14,303	24,578	92,922	139,211
30 Jul	2,464	6,338	4,924	19,610	2,742	10,115	95,664	149,326
31 Jul	717	2,096	5,641	21,706	1,173	3,808	96,837	153,134
1 Aug	392	1,950	6,033	23,656	4,390	8,381	101,227	161,515
2 Aug	217	1,353	6,250	25,009	11,261	17,154	112,488	178,669
3 Aug	49	345	6,299	25,353	18,704	25,183	131,192	203,852
4 Aug	198	1,080	6,498	26,433	14,503	25,263	145,695	229,115
5 Aug	100	523	6,598	26,956	9,331	16,937	155,026	246,052
6 Aug	84	489	6,682	27,445	7,645	12,521	162,671	258,573
7 Aug	71	384	6,753	27,829	4,899	8,613	167,571	267,186
8 Aug	74	392	6,827	28,221	5,993	10,738	173,564	277,924
9 Aug	125	435	6,952	28,657	1,633	4,779	175,197	282,703
10 Aug	103	351	7,054	29,007	944	3,206	176,141	285,908
11 Aug	61	209	7,116	29,216	438	1,634	176,579	287,543
12 Aug	38	131	7,154	29,347	345	1,100	176,924	288,643

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Date	Sockeye				Pink			
	Daily		Cum		Daily		Cum	
	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	0	0	0	0	0	0	0	0
8 Jul	0	0	0	0	0	0	0	0
9 Jul	0	0	0	0	15	115	15	115
10 Jul	0	0	0	0	0	0	15	115
11 Jul	9	29	9	29	13	131	29	246
12 Jul	11	36	20	65	12	134	41	380
13 Jul	5	18	26	84	38	377	79	758
14 Jul	7	22	32	106	26	295	105	1,053
15 Jul	21	70	53	175	26	297	131	1,350
16 Jul	7	24	60	199	77	847	207	2,197
17 Jul	11	37	71	236	75	756	282	2,954
18 Jul	35	130	106	366	56	697	338	3,650
19 Jul	22	88	128	454	44	583	383	4,234
20 Jul	22	83	150	537	81	991	464	5,225
21 Jul	81	286	231	823	122	1,437	586	6,661
22 Jul	79	271	311	1,094	149	1,692	735	8,353
23 Jul	72	245	383	1,339	167	1,778	902	10,131
24 Jul	139	470	522	1,809	398	4,110	1,300	14,241
25 Jul	104	355	626	2,163	414	4,220	1,714	18,462
26 Jul	105	352	731	2,516	320	3,144	2,034	21,606
27 Jul	55	188	786	2,703	233	2,504	2,267	24,110
28 Jul	195	648	981	3,351	558	5,155	2,825	29,265
29 Jul	339	1,124	1,319	4,475	996	9,160	3,821	38,425
30 Jul	482	1,405	1,802	5,880	1,041	6,958	4,863	45,382
31 Jul	105	319	1,906	6,199	321	2,300	5,183	47,682
1 Aug	198	640	2,104	6,839	308	2,886	5,491	50,568
2 Aug	300	997	2,404	7,836	466	4,764	5,957	55,332
3 Aug	334	1,146	2,738	8,982	530	6,031	6,487	61,363
4 Aug	732	2,355	3,470	11,336	1,134	10,100	7,622	71,463
5 Aug	535	1,705	4,005	13,041	873	7,457	8,495	78,921
6 Aug	346	1,121	4,351	14,163	468	4,432	8,963	83,353
7 Aug	331	1,045	4,682	15,208	375	3,339	9,338	86,692
8 Aug	879	2,573	5,562	17,780	394	3,580	9,732	90,272
9 Aug	1,114	2,636	6,675	20,416	481	3,081	10,213	93,353
10 Aug	761	1,785	7,437	22,201	474	2,607	10,687	95,960
11 Aug	403	936	7,840	23,137	300	1,506	10,987	97,466
12 Aug	188	472	8,028	23,609	148	844	11,136	98,310

Note: Ranges were determined from fish wheel catch criteria and DIDSON subsample estimates.

Appendix C2.—Estimated salmon passage ranges adjacent to the south bank of the Yentna River, 2009.

Date	Sockeye				Pink			
	Daily		Cum		Daily		Cum	
	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	47	93	47	93	16	75	16	75
8 Jul	25	67	72	160	19	68	35	143
9 Jul	27	73	99	233	20	72	55	215
10 Jul	103	261	202	494	59	220	114	435
11 Jul	135	466	337	959	205	564	319	999
12 Jul	398	1,248	735	2,207	443	1,341	762	2,340
13 Jul	789	2,713	1,524	4,920	1,219	3,365	1,980	5,704
14 Jul	1,233	3,969	2,757	8,889	1,577	4,649	3,557	10,353
15 Jul	1,989	5,642	4,746	14,531	1,715	5,736	5,272	16,089
16 Jul	3,888	10,601	8,634	25,132	2,951	10,272	8,223	26,362
17 Jul	5,159	13,498	13,793	38,630	3,587	13,013	11,810	39,375
18 Jul	1,865	7,824	15,658	46,454	5,741	12,986	17,551	52,361
19 Jul	1,473	6,019	17,131	52,473	5,002	11,618	22,553	63,979
20 Jul	1,538	5,791	18,669	58,265	4,293	10,821	26,845	74,800
21 Jul	1,607	6,085	20,276	64,349	5,120	12,839	31,966	87,639
22 Jul	1,281	4,975	21,557	69,324	4,150	10,141	36,116	97,780
23 Jul	1,348	4,484	22,905	73,808	2,818	8,039	38,933	105,819
24 Jul	1,248	4,805	24,153	78,613	5,639	13,902	44,573	119,721
25 Jul	682	3,081	24,835	81,694	6,706	14,088	51,279	133,809
26 Jul	518	2,429	25,353	84,123	6,333	12,815	57,611	146,624
27 Jul	433	1,781	25,786	85,903	3,550	8,196	61,161	154,819
28 Jul	646	2,758	26,432	88,661	3,963	8,807	65,124	163,626
29 Jul	937	3,398	27,369	92,059	2,673	6,992	67,796	170,618
30 Jul	499	1,338	27,868	93,397	423	1,500	68,219	172,118
31 Jul	478	1,278	28,346	94,676	622	2,318	68,842	174,436
1 Aug	885	2,806	29,231	97,481	1,957	5,862	70,799	180,298
2 Aug	1,780	6,483	31,011	103,964	8,865	23,106	79,664	203,404
3 Aug	1,664	6,260	32,675	110,225	16,615	41,909	96,279	245,313
4 Aug	1,214	4,244	33,889	114,468	10,875	39,157	107,154	284,470
5 Aug	561	1,998	34,450	116,466	7,778	27,999	114,932	312,469
6 Aug	540	1,893	34,990	118,359	6,152	19,436	121,084	331,905
7 Aug	529	1,831	35,519	120,190	4,906	16,190	125,990	348,095
8 Aug	575	1,950	36,095	122,141	3,253	12,994	129,244	361,089
9 Aug	263	911	36,358	123,051	2,055	8,738	131,298	369,827
10 Aug	182	602	36,539	123,654	635	3,003	131,933	372,831
11 Aug	115	384	36,654	124,038	461	2,215	132,394	375,046
12 Aug	163	525	36,817	124,563	565	2,186	132,959	377,232

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Date	Chum				Coho			
	Daily		Cum		Daily		Cum	
	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	0	0	0	0	5	43	5	43
8 Jul	0	0	0	0	2	18	7	62
9 Jul	0	0	0	0	2	18	9	80
10 Jul	0	0	0	0	1	12	10	91
11 Jul	8	26	8	26	5	54	15	145
12 Jul	33	104	41	130	7	79	22	224
13 Jul	25	80	66	210	43	475	65	699
14 Jul	23	73	89	283	73	783	137	1,482
15 Jul	115	357	204	641	84	891	221	2,373
16 Jul	74	232	278	873	158	1,680	379	4,053
17 Jul	139	431	416	1,304	300	3,022	680	7,076
18 Jul	99	327	515	1,631	199	2,202	879	9,278
19 Jul	108	354	623	1,985	345	3,410	1,224	12,688
20 Jul	155	499	778	2,484	414	3,835	1,638	16,522
21 Jul	154	496	932	2,980	604	5,284	2,242	21,807
22 Jul	134	432	1,066	3,412	408	3,732	2,650	25,539
23 Jul	100	318	1,166	3,729	456	3,765	3,106	29,303
24 Jul	234	749	1,400	4,478	869	6,906	3,975	36,210
25 Jul	249	808	1,650	5,286	757	6,331	4,732	42,540
26 Jul	120	395	1,769	5,680	690	5,790	5,423	48,330
27 Jul	135	435	1,905	6,115	575	4,362	5,998	52,692
28 Jul	206	658	2,111	6,773	426	3,681	6,424	56,373
29 Jul	226	701	2,337	7,475	339	2,915	6,763	59,288
30 Jul	96	277	2,433	7,752	58	521	6,821	59,808
31 Jul	137	392	2,570	8,144	279	1,738	7,100	61,547
1 Aug	219	662	2,788	8,805	446	3,301	7,546	64,847
2 Aug	407	1,287	3,195	10,092	1,932	13,691	9,478	78,538
3 Aug	367	1,180	3,562	11,272	4,220	27,421	13,698	105,959
4 Aug	1,193	3,509	4,755	14,781	8,444	37,455	22,143	143,414
5 Aug	1,199	3,462	5,953	18,243	6,211	27,058	28,354	170,472
6 Aug	1,166	3,351	7,119	21,594	3,114	16,137	31,468	186,608
7 Aug	1,484	4,070	8,603	25,664	2,671	13,728	34,139	200,336
8 Aug	2,007	5,045	10,610	30,709	2,970	13,263	37,109	213,598
9 Aug	1,839	4,413	12,448	35,122	2,332	9,727	39,441	223,326
10 Aug	1,012	2,331	13,461	37,453	899	3,750	40,340	227,076
11 Aug	917	2,052	14,377	39,505	688	2,872	41,028	229,948
12 Aug	642	1,440	15,020	40,945	373	1,974	41,400	231,922

Note: Ranges were determined from fish wheel catch criteria and DIDSON subsample estimates.

Appendix C3.—Yentna River north bank DIDSON estimates (total fish) by hour, 2009.

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
7 Jul	6	6	0	6	0	0	0	12	12	0	6	6
8 Jul	6	6	6	12	6	6	24	6	6	0	6	0
9 Jul	6	12	12	18	18	0	30	22	0	24	0	0
10 Jul	36	18	24	0	24	0	0	12	6	24	18	12
11 Jul	24	54	36	36	24	18	14	12	6	12	6	24
12 Jul	78	36	42	66	6	30	30	24	18	6	12	54
13 Jul	54	84	54	66	30	18	30	30	78	12	24	60
14 Jul	108	96	90	120	18	114	90	42	60	42	42	138
15 Jul	216	120	84	84	126	60	108	54	18	78	60	132
16 Jul	300	336	414	408	402	312	60	36	60	78	30	84
17 Jul	228	204	198	156	114	108	78	12	84	36	36	204
18 Jul	288	342	306	156	78	72	84	300	594	864	750	762
19 Jul	186	144	168	204	150	102	78	90	36	270	462	432
20 Jul	336	492	420	366	216	84	102	90	42	120	282	324
21 Jul	324	474	552	192	150	36	162	222	144	108	444	348
22 Jul	378	810	468	498	270	66	84	210	312	48	666	252
23 Jul	456	600	474	330	126	210	222	60	84	150	54	588
24 Jul	912	816	876	642	198	96	228	342	210	60	174	990
25 Jul	1,956	1,458	1,062	1,320	546	534	216	498	162	78	192	336
26 Jul	666	606	498	534	318	84	228	144	96	246	360	552
27 Jul	696	576	336	504	204	270	54	198	156	114	372	348
28 Jul	1,266	1,254	798	618	330	132	252	306	186	246	294	504
29 Jul	972	864	732	1,014	672	252	636	492	438	288	882	360
30 Jul	2,538	1,908	1,326	918	756	582	570	408	840	708	288	510
31 Jul	54	66	54	54	18	12	24	30	42	36	96	42
1 Aug	372	264	66	12	0	6	6	0	0	96	102	414
2 Aug	384	258	252	168	96	78	96	114	138	420	444	1,422
3 Aug	1,128	876	606	984	288	270	258	378	324	108	996	678
4 Aug	1,590	1,584	1,110	1,158	486	522	474	1,878	432	636	390	1,446
5 Aug	1,614	1,098	834	1,188	486	294	420	570	588	414	606	552
6 Aug	1,434	960	978	852	372	330	258	162	366	246	174	456
7 Aug	744	420	258	426	216	168	174	174	210	114	348	408
8 Aug	1,158	696	726	570	132	144	228	408	294	210	528	396
9 Aug	678	390	414	252	162	240	228	114	240	198	318	60
10 Aug	300	330	210	258	96	156	108	144	150	138	198	174
11 Aug	174	228	138	150	126	102	108	90	30	78	102	48
12 Aug	156	90	42	66	48	36	30	114	48	36	48	54
Total	21,822	18,576	14,664	14,406	7,308	5,544	5,792	7,798	6,510	6,342	9,810	13,170
% Total	6.9	5.8	4.6	4.5	2.3	1.7	1.8	2.5	2.0	2.0	3.1	4.1
% Cum	6.9	12.7	17.3	21.8	24.1	25.9	27.7	30.1	32.2	34.2	37.3	41.4

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Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
7 Jul	0	6	0	0	12	12	0	0	0	6	6	12
8 Jul	12	12	6	6	6	6	12	6	0	18	6	12
9 Jul	0	6	0	24	18	18	18	12	12	18	6	19
10 Jul	6	6	12	12	12	12	0	6	12	42	6	18
11 Jul	30	18	30	30	24	30	54	60	24	66	30	18
12 Jul	0	30	24	6	6	12	12	18	30	90	60	102
13 Jul	36	42	30	36	18	90	114	120	72	72	150	96
14 Jul	24	24	42	6	54	96	72	150	120	198	102	138
15 Jul	36	54	18	42	24	48	78	48	48	72	156	78
16 Jul	30	30	156	132	174	168	84	330	168	60	204	306
17 Jul	102	216	36	48	84	78	150	144	102	120	114	162
18 Jul	84	126	60	126	84	96	72	294	132	330	156	324
19 Jul	24	336	204	246	300	282	324	660	252	360	246	330
20 Jul	198	96	114	282	120	426	114	1,002	294	276	306	78
21 Jul	114	252	378	318	378	432	768	1,278	288	240	384	348
22 Jul	210	90	498	480	564	474	564	1,272	396	258	414	108
23 Jul	114	150	324	144	120	204	438	864	594	516	438	396
24 Jul	264	300	306	510	372	780	762	1,728	1,296	420	1,248	1,026
25 Jul	120	594	408	804	798	606	252	894	264	288	276	384
26 Jul	174	498	174	462	720	408	438	1,254	444	240	270	366
27 Jul	156	216	372	318	306	516	300	1,362	300	492	384	636
28 Jul	252	402	252	108	438	840	1,068	1,812	960	990	835	726
29 Jul	192	1,260	1,242	1,170	1,206	1,926	1,830	3,144	1,362	2,394	1,578	1,704
30 Jul	588	420	372	294	324	180	222	222	276	54	162	42
31 Jul	192	204	288	294	156	306	366	408	882	420	600	420
1 Aug	408	378	678	564	528	1,080	948	684	912	852	678	318
2 Aug	846	882	654	1,314	954	2,064	1,248	1,860	1,290	1,254	996	1,025
3 Aug	774	1,356	924	780	882	3,204	3,456	2,586	912	648	2,040	1,770
4 Aug	696	624	636	870	2,196	1,188	2,508	1,482	2,364	1,188	1,086	1,080
5 Aug	396	870	1,644	576	624	816	672	1,746	678	666	942	378
6 Aug	192	192	708	684	786	726	852	1,110	432	450	426	396
7 Aug	384	324	384	270	426	684	528	804	534	510	498	486
8 Aug	522	486	636	390	546	618	462	996	438	558	408	660
9 Aug	114	198	174	120	324	342	354	888	234	246	300	126
10 Aug	96	150	144	120	150	210	126	438	282	336	204	246
11 Aug	72	60	90	72	90	156	138	132	72	30	126	132
12 Aug	64	64	64	64	64	64	64	64	64	64	64	64
Total	7,522	10,972	12,082	11,722	13,888	19,198	19,468	29,878	16,540	14,842	15,905	14,530
% Total	2.4	3.4	3.8	3.7	4.4	6.0	6.1	9.4	5.2	4.7	5.0	4.6
% Cum	43.8	47.2	51.0	54.7	59.0	65.1	71.2	80.6	85.8	90.4	95.4	100

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Appendix C4.—Yentna River south bank DIDSON estimates (total fish) by hour, 2009.

Date	Counts by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
7 Jul	0	12	0	6	0	6	0	8	8	18	18	0
8 Jul	6	0	18	12	6	0	0	0	18	0	0	0
9 Jul	0	0	0	12	0	0	6	0	0	0	12	0
10 Jul	0	18	6	0	0	0	30	0	30	0	6	18
11 Jul	12	18	12	42	18	30	6	12	36	48	30	84
12 Jul	30	72	84	48	42	18	54	24	42	48	48	162
13 Jul	180	114	138	144	186	42	78	186	264	222	156	276
14 Jul	264	336	210	360	276	246	186	216	132	252	144	450
15 Jul	282	180	420	426	390	252	324	318	348	174	456	498
16 Jul	294	360	420	402	390	324	419	380	447	582	546	600
17 Jul	624	1,002	930	756	678	408	492	366	624	996	882	1,182
18 Jul	798	786	666	654	462	228	384	300	612	870	738	792
19 Jul	348	510	630	462	576	342	174	312	462	486	660	786
20 Jul	492	420	282	258	396	228	204	162	414	312	462	1,218
21 Jul	498	522	594	558	312	276	312	606	564	582	612	1,104
22 Jul	492	708	858	732	714	294	432	414	246	186	318	396
23 Jul	384	402	348	438	324	156	96	162	276	144	228	318
24 Jul	456	420	282	396	426	198	126	282	324	360	492	846
25 Jul	234	990	816	666	576	312	204	174	468	390	594	978
26 Jul	384	288	402	540	462	240	264	438	450	456	408	690
27 Jul	258	420	438	348	288	216	258	192	258	174	348	492
28 Jul	456	480	354	396	246	252	408	282	366	240	264	600
29 Jul	312	420	384	606	336	192	204	180	216	318	258	678
30 Jul	222	246	210	156	24	84	132	30	78	30	120	72
31 Jul	36	48	18	24	18	6	6	12	12	6	12	30
1 Aug	372	312	186	72	54	48	60	96	54	102	42	204
2 Aug	192	198	114	162	126	162	144	84	198	366	1,050	3,450
3 Aug	1,704	1,872	1,758	1,710	1,374	1,578	1,266	294	1,224	276	1,638	2,304
4 Aug	1,368	1,494	2,040	1,482	1,722	1,668	1,596	1,008	1,944	2,646	2,202	2,700
5 Aug	2,562	1,566	1,614	1,470	1,512	972	1,200	1,044	1,080	1,578	1,962	2,310
6 Aug	930	1,008	930	858	600	522	780	408	1,008	900	750	624
7 Aug	846	936	540	432	594	300	342	354	420	546	624	696
8 Aug	672	702	750	672	552	330	672	624	648	318	930	552
9 Aug	798	738	714	438	444	472	438	450	528	498	648	552
10 Aug	474	312	378	324	318	108	156	222	258	156	276	174
11 Aug	150	252	234	168	132	96	54	48	168	138	186	222
12 Aug	120	186	150	192	102	114	66	150	138	216	198	162
Total	17,250	18,348	17,928	16,422	14,676	10,720	11,573	9,838	14,363	14,634	18,318	26,220
% Total	3.6	3.8	3.7	3.4	3.0	2.2	2.4	2.0	3.0	3.0	3.8	5.4
% Cum	3.6	7.4	11.1	14.4	17.5	19.7	22.1	24.1	27.1	30.1	33.9	39.3

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Date	Counts by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
7 Jul	12	6	6	5	6	0	0	12	6	0	0	0
8 Jul	0	0	0	0	0	0	0	0	0	0	0	0
9 Jul	12	6	6	0	12	6	0	12	0	0	0	18
10 Jul	6	18	36	30	12	24	18	24	0	18	18	12
11 Jul	24	42	66	24	30	30	6	42	0	6	66	30
12 Jul	90	60	102	90	84	42	48	222	114	132	96	30
13 Jul	218	232	246	236	264	198	246	126	144	162	48	132
14 Jul	282	180	378	288	162	192	282	294	264	294	156	162
15 Jul	324	300	444	438	282	288	348	396	324	198	348	204
16 Jul	642	846	906	702	804	654	738	972	618	546	1,098	774
17 Jul	828	696	1,542	990	924	558	678	1,074	738	642	624	516
18 Jul	432	546	966	264	972	528	804	1,368	348	462	648	588
19 Jul	840	654	822	414	936	1,026	732	1,266	408	510	180	120
20 Jul	702	942	954	978	828	822	678	1,044	270	366	402	234
21 Jul	222	834	1,272	690	955	660	960	1,314	606	594	498	252
22 Jul	324	1,392	744	492	636	282	204	582	360	522	522	246
23 Jul	216	84	882	552	492	384	684	1,002	642	1,026	504	354
24 Jul	576	732	978	720	1,128	1,290	984	1,938	786	1,296	1,038	438
25 Jul	1,050	792	654	1,326	876	936	876	912	708	540	462	450
26 Jul	684	744	678	774	846	1,074	690	1,560	906	594	504	246
27 Jul	336	294	312	495	600	738	690	624	372	522	444	384
28 Jul	366	720	612	558	528	288	552	846	498	318	378	204
29 Jul	300	486	366	210	540	462	426	636	516	210	150	204
30 Jul	42	66	84	96	54	84	66	102	60	55	54	12
31 Jul	48	84	108	96	138	342	270	366	384	654	348	276
1 Aug	126	288	348	456	630	810	624	810	726	336	462	348
2 Aug	1,476	1,374	2,040	1,488	1,770	2,316	2,028	2,160	2,316	1,518	1,596	1,446
3 Aug	1,560	2,334	4,074	2,976	3,798	2,976	3,348	2,598	2,568	2,400	1,938	1,632
4 Aug	2,424	2,442	2,370	2,568	3,078	3,012	2,400	2,892	2,634	2,376	2,670	1,698
5 Aug	2,238	1,650	2,028	1,452	1,860	2,106	2,094	1,464	984	1,044	1,344	534
6 Aug	1,344	1,170	1,500	1,812	1,428	1,584	1,482	1,866	1,206	918	876	696
7 Aug	1,026	1,128	1,146	1,164	1,308	1,752	1,530	1,860	1,308	1,074	1,176	690
8 Aug	912	1,086	978	1,068	1,062	1,410	1,128	1,332	1,044	894	762	714
9 Aug	552	432	768	984	858	642	678	546	576	678	497	264
10 Aug	198	150	240	288	198	312	192	330	174	150	186	132
11 Aug	204	288	192	216	378	234	258	312	126	114	174	108
12 Aug	150	150	150	150	150	150	150	150	150	150	150	150
Total	20,786	23,248	28,998	25,090	28,627	28,212	26,892	33,054	22,884	21,319	20,417	14,298
% Total	4.3	4.8	6.0	5.2	5.9	5.8	5.6	6.8	4.7	4.4	4.2	3.0
% Cum	43.6	48.4	54.4	59.6	65.5	71.3	76.9	83.7	88.4	92.8	97.0	100

Appendix C5.—Daily DIDSON (ten minutes) subsample counts and range from the transducer for the Yentna River, 2009.

Date	North Bank Subsample Counts (DIDSON)				South Bank Subsample Counts (DIDSON)					
	No. Fish @ Range (m)			Total	No. Fish @ Range (m)			Total		
	1 10	10 30			1 10	10 20				
7 Jul	18	100.0%	0	0.0%	18	22	100.0%	0	0.0%	22
8 Jul	31	100.0%	0	0.0%	31	10	100.0%	0	0.0%	10
9 Jul	47	100.0%	0	0.0%	47	17	100.0%	0	0.0%	17
10 Jul	53	100.0%	0	0.0%	53	53	98.1%	1	1.9%	54
11 Jul	112	100.0%	0	0.0%	112	119	100.0%	0	0.0%	119
12 Jul	132	100.0%	0	0.0%	132	291	98.0%	6	2.0%	297
13 Jul	233	98.7%	3	1.3%	236	705	99.9%	1	0.1%	706
14 Jul	330	99.7%	1	0.3%	331	983	98.2%	18	1.8%	1,001
15 Jul	304	99.0%	3	1.0%	307	1,311	98.8%	16	1.2%	1,327
16 Jul	710	97.7%	17	2.3%	727	2,363	98.0%	48	2.0%	2,411
17 Jul	461	98.3%	8	1.7%	469	3,112	99.6%	13	0.4%	3,125
18 Jul	1,070	99.1%	10	0.9%	1,080	2,520	99.4%	16	0.6%	2,536
19 Jul	974	99.3%	7	0.7%	981	2,238	98.3%	38	1.7%	2,276
20 Jul	996	96.7%	34	3.3%	1,030	2,141	98.3%	37	1.7%	2,178
21 Jul	1,326	95.5%	63	4.5%	1,389	2,522	98.3%	44	1.7%	2,566
22 Jul	1,520	97.1%	45	2.9%	1,565	1,983	98.4%	33	1.6%	2,016
23 Jul	1,246	97.6%	30	2.4%	1,276	1,677	99.6%	6	0.4%	1,683
24 Jul	2,337	96.3%	89	3.7%	2,426	2,720	98.8%	32	1.2%	2,752
25 Jul	2,218	94.7%	123	5.3%	2,341	2,581	96.9%	83	3.1%	2,664
26 Jul	1,560	95.7%	70	4.3%	1,630	2,331	97.7%	56	2.3%	2,387
27 Jul	1,455	95.0%	76	5.0%	1,531	1,544	97.5%	40	2.5%	1,584
28 Jul	2,379	96.0%	99	4.0%	2,478	1,668	98.0%	34	2.0%	1,702
29 Jul	4,421	99.7%	14	0.3%	4,435	1,422	99.1%	13	0.9%	1,435
30 Jul	2,418	100.0%	0	0.0%	2,418	363	100.0%	0	0.0%	363
31 Jul	844	100.0%	0	0.0%	844	557	100.0%	0	0.0%	557
1 Aug	1,561	100.0%	0	0.0%	1,561	1,261	100.0%	0	0.0%	1,261
2 Aug	3,042	100.0%	1	0.0%	3,043	4,606	99.5%	23	0.5%	4,629
3 Aug	4,300	98.4%	71	1.6%	4,371	8,106	98.9%	94	1.1%	8,200
4 Aug	4,373	95.0%	231	5.0%	4,604	8,616	98.6%	123	1.4%	8,739
5 Aug	2,923	93.9%	189	6.1%	3,112	6,163	98.2%	115	1.8%	6,278
6 Aug	2,181	96.6%	76	3.4%	2,257	4,117	98.0%	83	2.0%	4,200
7 Aug	1,490	94.2%	92	5.8%	1,582	3,569	98.3%	63	1.7%	3,632
8 Aug	1,939	95.3%	96	4.7%	2,035	3,250	98.4%	52	1.6%	3,302
9 Aug	1,053	94.1%	66	5.9%	1,119	2,311	97.7%	54	2.3%	2,366
10 Aug	757	95.3%	37	4.7%	794	917	96.4%	34	3.6%	951
11 Aug	405	95.5%	19	4.5%	424	718	96.8%	24	3.2%	742
12 Aug	121	94.5%	7	5.5%	128	293	98.0%	6	2.0%	299
Total	51,341	97.0%	1,577	3.0%	52,917	79,180	98.5%	1,206	1.5%	80,386
Std Dev		2.2%		2.2%		Std Dev	1.0%		1.0%	
var		0.0%		0.0%		var	0.0%		0.0%	